Defence Research and Development Canada
Recherche et développement pour la défense Canada

DEFENCE DÉFENSE

Helicopter Maritime Environment Trainer: Operator Manual

Edited by:

Leo Boutette

Ken Ueno

Jason Dielschneider

This manual represents the operation of the HelMET System as originally installed with hardware updates to the current date. For current system start-up procedures consult the Helicopter Maritime Environment Trainer (HelMET) Start-Up, Virtual Lesson Plan (VLP) Editor & Shutdown Manual Application Version 4.0. For current Operational Procedures consult the Helmet 4 4 IOS User's Guide _Rev_011.

Defence R&D Canada
Technical Memorandum
DRDC Toronto TM 2011-047
June 2011

Canada

Helicopter Maritime Environment Trainer: Operator Manual

Edited by:

Leo Boutette

Ken Ueno

Jason Dielschneider

Defence R&D Canada – Toronto

Technical Memorandum
DRDC Toronto TM 2011-047
June 2011

This manual represents the operation of the HelMET System as originally installed with hardware updates to the current date. For current system start-up procedures consult the Helicopter Maritime Environment Trainer (HelMET) Start-Up, Virtual Lesson Plan (VLP) Editor & Shutdown Manual Application Version 4.0. For current Operational Procedures consult the Helmet 4 4 IOS User's Guide _Rev_011.

Principal Author

Original signed by See Original Document. Edited by: Leo Boutette , Ken Ueno, Jason Dielschneider

See Original Document. Edited by: Leo Boutette , Ken Ueno, Jason Dielschneider

Human Effectiveness Exploitation Centre

Approved by

Original signed by David Eaton

David Eaton

Section Head, Human Effectiveness Exploitation Centre

Approved for release by

Original signed by Dr. Stergios Stergiopoulos

Dr. Stergios Stergiopoulos

Acting Chair, Knowledge and Information Management Committee

Acting Chief Scientist

This document is a revision of DRDC Toronto Document: CR2002-022 Atlantis Document: ED997-00368 titled Helicopter Maritime Environment Trainer: Operator Manual with updates to Version 4.4 of the HelMET software.

Abstract

The Helicopter Maritime Environment Trainer (HelMET) was developed by Defence R&D Canada – Toronto (DRDC Toronto) for training helicopter pilots to land on the flight deck of a Canadian Patrol Frigate (CPF) in a virtual environment. The HelMET was installed at 12 Wing, Canadian Forces Base (CFB) Shearwater, Nova Scotia, Canada. [reference: Summary per document cited in next paragraph].

DRDC Toronto Document: CR2002-022 Atlantis Document: ED997-00368 titled Helicopter Maritime Environment Trainer: Operator Manual documented Version 1.1 of the HelMET Software.

As third party support for the HelMET system did not come to fruition, DRDC Toronto has been supporting the HelMET system at 12th Wing Shearwater with hardware and software updates. The current version of HelMET is Version 4.4. Many of the updates implemented were made to allow the simulator to be used as a procedures trainer.

This document is a revision of CR2002-022 updated to reflect the large number of changes that have been implemented by DRDC Toronto since version 1.1. The purpose of this document is to update the description so that the system can be maintained and operated by Director Aerospace Development Program Management, Radar and Communications Systems or its representatives.

Résumé

Le Simulateur d’entraînement virtuel pour hélicoptère maritime (HelMET) a été développé par Recherche et développement pour la défense Canada – Toronto (RDDC Toronto) afin d’entraîner les pilotes d’hélicoptère à l’atterrissage sur le pont d’envol d’une frégate canadienne de patrouille dans un environnement virtuel. Le système HelMET a été installé à la 12e Escadre, Base des Forces canadiennes Shearwater, Nouvelle-Écosse, Canada [référence : sommaire par document cité dans le paragraphe suivant].

Document RDDC Toronto : CR2002-022, document Atlantis : ED997-00368 intitulé Simulateur d’entraînement virtuel pour hélicoptère maritime : Manuel de l’opérateur, documentation de la version 1.1 du logiciel HelMET.

Étant donné que la prise en charge du système HelMET par un tiers ne s’est pas réalisée, c’est RDDC Toronto qui en assure, par conséquent, le soutien à la 12e Escadre Shearwater au moyen de mises à niveau de matériel et de mises à jour de logiciel. La dernière version du logiciel HelMET est la version 4.4. De nombreuses fonctionnalités qui ont été implémentées visaient à permettre au simulateur d’être utilisé comme système d’entraînement aux procédures.

Le présent document est une révision du document CR2002-022 dont la mise à jour vise à refléter le grand nombre de modifications apportées au logiciel par RDDC Toronto depuis la version 1.1. L'objectif de ce document est de mettre à jour les descriptions de façon à ce que le système puisse être maintenu et utilisé par le Directeur – Gestion du programme de développement aérospatial (système de radar et de communication) ou ses représentants.

Executive summary

Helicopter Maritime Environment Trainer: Operator Manual:

Leo Boutette; DRDC Toronto TM 2011-047 ; Defence R&D Canada – Toronto; June 2011.

The Helicopter Maritime Environment Trainer (HelMET) was developed by Defence R&D Canada – Toronto (DRDC Toronto) for training helicopter pilots to land on the flight deck of a Canadian Patrol Frigate (CPF) in a virtual environment. The HelMET was installed at 12 Wing, Canadian Forces Base (CFB) Shearwater, Nova Scotia, Canada. [reference: Summary per document cited in next paragraph].

DRDC Toronto Document: CR2002-022 Atlantis Document: ED997-00368 titled Helicopter Maritime Environment Trainer: Operator Manual documented Version 1.1 of the HelMET Software.

As third party support for the HelMET system did not come to fruition, DRDC Toronto has been supporting the HelMET system at 12th Wing Shearwater with hardware and software updates. The current version of HelMET is Version 4.4. Many of the updates implemented were made to allow the simulator to be used as a procedures trainer.

This document is a revision of CR2002-022 updated to reflect the large number of changes that have been implemented by DRDC Toronto since version 1.1. The purpose of this document is to update the description so that the system can be maintained and operated by Director Aerospace Development Program Management, Radar and Communications Systems or its representatives.

Sommaire

Simulateur d’entraînement virtuel maritime : Manuel de l'opérateur :

Leo Boutette; DRDC Toronto TM 2011-047 ; R & D pour la défense Canada – Toronto; Juin 2011.

Le Simulateur d’entraînement virtuel pour hélicoptère maritime (HelMET) a été développé par Recherche et développement pour la défense Canada – Toronto (RDDC Toronto) afin d’entraîner les pilotes d’hélicoptère à l’atterrissage sur le pont d’envol d’une frégate canadienne de patrouille dans un environnement virtuel. Le système HelMET a été installé à la 12e Escadre, Base des Forces canadiennes Shearwater, Nouvelle-Écosse, Canada [référence : sommaire par document cité dans le paragraphe suivant].

Document RDDC Toronto : CR2002-022, document Atlantis : ED997-00368 intitulé Simulateur d’entraînement virtuel pour hélicoptère maritime : Manuel de l’opérateur, documentation de la version 1.1 du logiciel HelMET.

Étant donné que la prise en charge du système HelMET par un tiers ne s’est pas réalisée, c’est RDDC Toronto qui en assure, par conséquent, le soutien à la 12e Escadre Shearwater au moyen de mises à niveau de matériel et de mises à jour de logiciel. La dernière version du logiciel HelMET est la version 4.4. De nombreuses fonctionnalités qui ont été implémentées visaient à permettre au simulateur d’être utilisé comme système d’entraînement aux procédures.

Le présent document est une révision du document CR2002-022 dont la mise à jour vise à refléter le grand nombre de modifications apportées au logiciel par RDDC Toronto depuis la version 1.1. L’objectif de ce document est de mettre à jour les descriptions de façon à ce que le système puisse être maintenu et utilisé par le Directeur – Gestion du programme de développement aérospatial (système de radar et de communication) ou ses représentants.

SYSTEM USAGE WARNING

AT THE REQUEST OF THE CANADIAN FORCES (CF), DRDC TORONTO CONSTRUCTED A LOW COST EXPLORATORY DEVELOPMENT SIMULATOR FOR SEA KING HELICOPTER DECK LANDING (HDLS). THE HDLS WAS VALIDATED IN AN EXPERIMENTAL INTER-SIMULATOR TRANSFER OF TRAINING STUDY.
BASED ON THE RESULTS AND FAVOURABLE COMMENTS FROM EXPERIENCED SEA KING PILOTS, CF REQUESTED THE PRODUCTION OF A SIMULATOR TO "DEMONSTRATE TO THE MARTIME HELICOPTER COMMUNITY THE CAPABILITIES OF THE SIMULATOR AND GET THEM INVOLVED IN THE PROCESS OF DEVELOPING THE STRETCH POTENTIAL OF THIS TECHNOLOGY". WITH THE ASSISTANCE OF PILOTS, THE HDLS WAS RE-CONFIGURED (HelMET, PILOT/INSTRUCTOR OPERATOR STATION OPERATOR) TO DIRECTLY EVALUATE TRANSFER OF TRAINING IN SHEARWATER. THE DESIGN FOCUS WAS TO PROVIDE A HELICOPTER MARITIME ENVIRONMENT TRAINER (HelMET) CAPABLE OF THREE OPERATION SEQUENCES (DAYTIME LAND/LAUNCH FREE DECK & HAUL DOWN, AND NIGHT TIME FREE DECK OPERATIONS) AS DERIVED FROM SHIPBORNE HELICOPTER OPERATIONS PROCEDURES (SHOPS).

AT THE SUGGESTION OF 12 WING, ISSUES SUCH AS THE CONSTRUCTION OF A BARRIER AROUND THE MOTION BASE AND PLATFORM WILL BE EXPLORED BY THE PILOTING COMMUNITY AFTER THE INSTALLATION IN SHEARWATER. THEREFORE CAUTION SHOULD BE EXERCISED IN THE USE OF THE SIMULATOR CONSISTENT WITH ITS PLANNED USAGE. THESE CAUTIONS INCLUDE CARE IN THE MOUNTING OF THE MOTION PLATFORM, ATTENTION TO THE OPERATIONS SEQUENCES OF POWERING THE MOTION PLATFORM, KEEPING ALL PERSONNEL AT AN ADEQUATE DISTANCE FROM THE PLATFORM DURING ITS OPERATION, AND NOT USING THE PLATFORM OUTSIDE OF ITS DESIGN LIMITS.

WARNING

THE MOTION BASE IS IN A ‘PARKED POSITION’ WHEN THE SIMULATOR IS NOT IN USE. AS THE SIMULATOR IS ACTIVATED, THE MOTION BASE IS RAISED FROM ITS PARKED POSITION TO A NEUTRAL POSITION, BUT DOES NOT BEGIN TO MOVE UNTIL THE INSTRUCTOR OPERATOR STATION (IOS) OPERATOR STARTS THE MOTION BASE BY PRESSING THE ‘START’ BUTTON ON THE IOS OPERATOR GRAPHIC USER INTERFACE. THE NORMAL METHOD FOR SHUTTING DOWN THE MOTION BASE IS THE IOS OPERATOR BRINGS THE MOTION BASE TO A NEUTRAL AND THEN PARKED POSITION, ACCORDING TO THE PROCEDURES IN SECTION 4 ON SIMULATOR OPERATING PROCEDURES IN THE OPERATOR MANUAL.

APART FROM THE NORMAL PROCEDURE FOR STOPPING THE MOTION BASE, FOUR SWITCHES ARE AVAILABLE TO DIS-ENGAGE THE MOTION BASE: AN EMERGENCY BUTTON LOCATED ON THE ELECTRICAL POWER CONTROL PANEL, A SWITCH ON THE MOTION PLATFORM CONTROL COMPUTER, A STOP BUTTON AT THE IOS OPERATOR CONSOLE, AND A SWITCH (TRIGGER) ON THE COLLECTIVE PITCH LEVER AVAILABLE TO THE PILOT. WE DO NOT RECOMMEND THE SWITCH (TRIGGER) ON THE COLLECTIVE PITCH LEVER FOR ROUTINE USE. HOWEVER, SHOULD THE PILOT NEED TO DIS-ENGAGE THE MOTION BASE IN AN EMERGENCY, THE SWITCH (TRIGGER) SHOULD BE PULLED AND HELD IN POSITION FOR APPROXIMATELY 3 TO 5 SECONDS, THE IOS OPERATOR WILL THEN NEED TO BE CALLED FOR AN ORDERLY SHUTDOWN. THE STUDENT/PILOT WILL NEED TO CONTINUE HOLDING THE TRIGGER UNTIL THE IOS OPERATOR REPORTS THE PLATFORM PARKED. **NOTE:** THE TRIGGER ONLY STOPS PLATFORM MOTION WHEN HELD IN POSITION. IF THE TRIGGER IS RELEASED PRIOR TO PARKING, THE PLATFORM WILL RESUME MOVING.

WARNING

THE VOLTAGES EMPLOYED IN THIS EQUIPMENT ARE SUFFICIENTLY HIGH TO ENDANGER HUMAN LIFE. A RESONABLE PRECAUTION HAS BEEN OBSERVED IN DESIGN TO SAFEGUARD THE OPERATING PERSONNEL. OPERATING PERSONNEL SHOULD BE PROHIBITED FROM TAMPERING WITH PROTECTIVE DEVICES SUCH AS MOTION SWITCHES, POWER CONTROL PANEL, AND EMERGENCY BUTTONS. THE POWER SHOULD BE REMOVED COMPLETELY AND THE HIGH-VOLTAGE CAPACITORS IN POWER SUPPLIES DISCHARGED WITH THE AID OF A SHORTING BAR BEFORE MAKING ANY INTERNAL ADJUSTMENTS.

SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. Under certain conditions, dangerous potentials may exist when the power control is in the off position, due to the charges retained by capacitors. To avoid casualties always remove power and discharge and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting except in the presence of someone who is capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of first aid and resuscitation.

NOTES TO USERS

WARNING, CAUTION, and NOTE data are defined in the following manner:

WARNING
To emphasize operating procedures, practices, etc., which, if not correctly followed, could result in personal injury or loss of life.

CAUTION
To emphasize operating procedures, practices, etc., which, if not correctly followed, could result in damage to or destruction of equipment.

NOTE
To highlight a procedure, event or practice that is desirable or essential.

BE PREPARED for the EMERGENCY

KNOW HOW!

DROWNING

1. REMOVE FROM WATER
2. LOOSEN CLOTHING
3. PLACE PATIENT FACE UPWARDS - CLEAR MOUTH IF NECESSARY
4. APPLY ARTIFICIAL RESPIRATION
5. SEND FOR A DOCTOR
6. KEEP WARM - WITH BLANKETS, ETC.

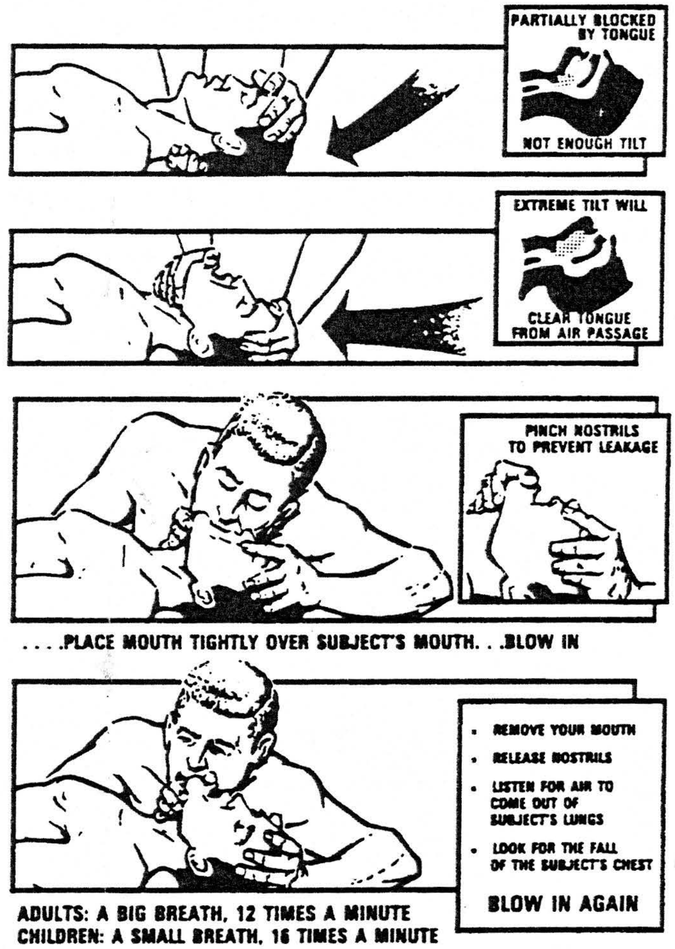
GASSING

1. REMOVE TO FRESH AIR
2. LOOSEN CLOTHING
3. PLACE PATIENT FACE UPWARDS - CLEAR MOUTH IF NECESSARY
4. APPLY ARTIFICIAL RESPIRATION
5. SEND FOR A DOCTOR
6. KEEP WARM - WITH BLANKETS, ETC.

ELECTRIC SHOCK

1. PROTECT YOURSELF - WITH DRY INSULATING MATERIAL DRY LEATHER, WOOD, RUBBER, ETC.
2. BREAK THE CIRCUIT - BY OPENING THE POWER SWITCH OR BY PULLING THE VICTIM FREE OF THE LINE CONDUCTOR
3. DON'T TOUCH THE VICTIM WITH BARE HANDS - UNTIL THE CIRCUIT IS BROKEN
4. REMOVE FOREIGN MATTER, CHEWING GUM, ETC. FROM THE VICTIM'S MOUTH
5. START ARTIFICIAL RESPIRATION QUICKLY
6. SEND FOR A DOCTOR
7. KEEP PATIENT WARM - WITH BLANKETS, ETC.

MOUTH TO MOUTH BREATHING



AIR PASSAGES MUST BE KEPT OPEN AT ALL TIMES

IF AIR PASSAGES ARE NOT OPEN THERE WILL BE

- NO SOUND OF ESCAPING AIR
- NO RISE OR FALL OF THE CHEST
- RESISTANCE WHEN BLOWING INTO THE SUBJECT'S MOUTH

THEREFORE CHECK NECK AND HEAD POSITION AGAIN

CHECK MOUTH AND THROAT FOR FOREIGN SUBSTANCES.

HOLGER-NEILSON METHOD OF ARTIFICIAL RESPIRATION

If breathing stops because of electrocution, drowning, sedative poisoning, gas poisoning, suffocation, or poliomyolitis, start artificial respiration immediately. Don't delay – seconds count. As soon as possible, send someone for a physician.

THE STANDARD TECHNIQUE FOR THE BACK PRESSURE/ARM LIFT METHOD IS AS FOLLOWS:

PLACE THE PATIENT FACE DOWN, ELBOWS BENT, ONE HAND ON THE OTHER WITH THE FACE TURNED TO ONE SIDE.

PLACE YOUR HANDS, THUMBS TOUCHING, JUST BELOW A LINE RUNNING BETWEEN THE ARMPITS.

ROCK FORWARD SLOWLY, ELBOWS STRAIGHT, UNTIL ARMS ARE VERTICAL.

ROCK BACKWARD, SLIDING YOUR HANDS TO THE PATIENT'S ARMS, JUST ABOVE THE ELBOWS.

RAISE THE ARMS UNTIL RESISTANCE AND TENSION ARE FELT AT THE PATIENT'S SHOULDERS.

REPEAT THE CYCLE 12 TIMES PER MINUTE

HelMET PARAMETERS AND CONSTRAINTS

Parameters	Constraints
	Helicopter
Descent rate	NOT to exceed 600 feet per minute (10 ft/s) corresponding to maximum safe deck landing relative descent rate
Pitch / roll	NOT to exceed 30 degrees below 40 feet above sea level (ASL) corresponding to safe deck landing procedure (DLP)
Yaw rate	NOT to exceed 90 degrees per second corresponding to safe deck landing procedure (DLP)
Speed	NOT to exceed 40 knots (25 m/s)
Altitude	Maintain 20 to 100 ft above ground level (AGL) post launch. Up to 304.8m (1000 ft) AGL based on atmospheric turbulence model
Landing	OCCURS at 9 feet AGL
Flying weight	16600 lbs (1100 lbs fuel)
Centre of gravity	Along the longitudinal centreline, 2.34 m above extended wheels
	Ship (interactive ship control)
Draft	5.070 m
Displacement	4692.416 m^3
Mass	4809.7264 tonnes
Centre of gravity	Vertical centre of gravity (VCG) = 6.70 m above baseline longitudinal centre of gravity (LCG) = 59.555 m fore of aft perpendicular position (APP)
	Ship (predetermined ship motion)
Draft	4.640 m
Displacement	4076.885 m^3
Mass	4178.808 tonnes
Centre of gravity	VCG = unknown LCG = 60.367 m
	Environment
Earth	Flat, non-rotating
Atmosphere	Aerodynamics model (U.S. Standard Atmosphere 1962 - no water vapour, moisture, or dust) Pressure = 760mm Hg (29.9213 in Hg, 101.3 kPa) at mean sea level (MSL, 0 altitude) Temperature = 15 °C at MSL Density = 1.2250 kg/m^3 Sea dynamics model (Fredyn - no moisture) Pressure = 736 mm Hg (28.9761 in Hg, 98.1 kPa) Temperature = 12.16 °C Density = 1.23 kg/m^3
Sea	Pierson-Moskowitz wave (swell) spectrum based on steady state of sufficiently large wind fetch and duration

This page intentionally left blank.

Table of contents

List of figures

List of tables

This page intentionally left blank.

1 Introduction

1.1 Purpose of the Sea King Helicopter Maritime Environment Trainer

The Sea King Helicopter Maritime Environment Trainer (HelMET), herein referred to as the simulator, Helicopter Deck Landing Simulator (HDLS), Virtual Reconfigurable Simulator (VR-Sim), or Reconfigurable Helicopter Simulator (RHS), is designed to provide comprehensive initial and refresher training in a virtual environment for pilots of Sea King helicopters in landing on a flight deck of a Canadian Patrol Frigate (CPF). Use of the simulator provides for effective training and evaluation while minimizing the high cost of operating ship and aircraft for training missions and eliminating the inherent danger of personal injury and/or damage of aircraft and/or ship.

1.2 Use of the Operator Manual

This Operator Manual (OM) has been prepared to aid instructors and operators in the effective utilization of the simulator. It provides instructors and operators with all the data necessary to prepare and conduct training sessions and to achieve course objectives through the use of the simulator. Personnel who will conduct exercises in the simulator should read this manual thoroughly to understand the purpose, capabilities, limitations, and procedures for effective utilization of the simulator.

This manual has been prepared for use by instructors who are fully qualified Sea King helicopter aircrew and officers, and by simulator operators who are experienced in the application of flight and procedural simulators in support of Canadian Forces training requirements. Both instructors and operators must be familiar with the functions of the Sea King aircraft system equipment, Canadian Patrol Frigate system equipment and the proper utilization of that equipment during a training mission for shipborne helicopter operational procedures. To avoid unnecessary duplication and to preclude possible conflicts in established employment procedures of operational equipment (e.g., flight control components and pilot seat) at the simulator, coverage of such equipment in this manual is limited to equipment identification and location. The user must refer to the appropriate Canadian Forces Technical Orders for operational equipment standardised operating and employment procedures.

1.3 Document Overview

This document describes the operational procedures to be used for the simulator operations. A brief outline of the contents of this document is given below:

Section 1 – Introduction

This section contains the introduction, which describes the purpose of the simulator equipment and the intended use of this manual.

Section 2 – Referenced Documents

This section lists by document number, title, revision, and date all documents referenced in this manual.

Section 3 – System Description

This section describes the simulator equipment. Particular attention is given to describing the instructor's displays and controls and explaining their use. Similar descriptions are provided for the pilot's displays and controls. Capabilities and limitations of the various systems are also included.

Section 4 – Operating Procedures

This section provides procedures for operating the simulator as well as detailed descriptions of graphical user interface (GUI). Start-up, shutdown, initialization, and other operations are also covered.

Section 5 – Examples of Training Scenarios

This section provides three basic training scenarios as examples. These scenarios are Day Time Freedeck Launch, Night Time Freedeck Recovery, and Day Time Hauldown.

Section 6 - Notes

This section contains general information.

Insofar as possible, technical terminology has been avoided in the preparation of this manual. Emphasis has been placed on clarity and accuracy of presentation.

2 Referenced Documents

The following government and non-government documents are referenced in this manual:

a. DRDC Toronto Specification	Helicopter Deck Landing Simulator & Landing Signalling Officer Simulator Preliminary Specification (Updated)
b. DRDC Toronto Technical Report	Helicopter Deck Landing Simulator: Technology Demonstrator by F.A. Lue And L.E. Magee
c. DRDC Toronto/12 Wing	Operational Sequence Diagram (OSD): Daytime Freedeck Launch
d. DRDC Toronto/12 Wing	Operational Sequence Diagram (OSD):Night-Time Freedeck Recovery
e. DRDC Toronto/12 Wing	Operational Sequence Diagram (OSD): Daytime Hauldown Recovery
f. C-12-124-A00/MB-000	Aircraft Operating Instructions, CH124 Sea King Helicopter, 2000
g. CFTO B-06-282-000/FP-000	Shipborne Helicopter Operating Procedures (SHOP)
h. DRDC Toronto Document:CR2002-027 Atlantis Document:ED990-01155	Helicopter Maritime Environment Trainer: Software Test Document
i. DRDC Toronto Document:CR2002-031 Atlantis Document:VD905-03128	Helicopter Maritime Environment Trainer: Version Description Document
j. Tyan	B4985 Transport FT48 Service Engineers Manual Barebone System
k. Tyan	S4985 Thunder n4250QE User's Manual

l.	Servos and Simulation, Inc.	Six Degree of Freedom Motion Platform, Maintenance Document, October 1997
m.	BG Systems, Inc.	CerealBox Hardware Manual, 4.0 2,November 1998
n.	BG Systems, Inc.	LV824 Software Manual, 4.03, June 1999
o.	Polhemus Inc.	3SPACE FASTRAK User’s Manual, Revision F, November, 1993
p.	Virtual Research Systems, Inc.	VR1280 Owner’s Manual
q.	NVIS Inc.	NVIS S Series Product User Guide, 1998
r.	Yamaha	DEQ7 Digital Equalizer Operating Manual
s.	BSS Audio Ltd.	FDS 360 User’s Manual

3 System Description

3.1 Simulator General Description

The HelMET was developed by Defence R&D Canada - Toronto (DRDC Toronto) to train helicopter pilots to land on the flight deck of a Canadian Patrol Frigate (CPF) in a virtual environment.

The HelMET was installed at 12 Wing, Canadian Forces Base (CFB) Shearwater, Nova Scotia, Canada.

The simulator consists of the following major areas, as illustrated in

Figure 1:

- Administration Station
- Low Frequency Station
- IOS Operator Station
- Trainee Pilot Station
- Second Pilot Station
- Landing Signals Officer Station
- Equipment Rack Station2
- Motion Platform Power Station
- Equipment Rack Station1
- Medium Frequency Station
- Audio Communication Subsystem Station.

The Administration Station provides the computing facilities for simulations and controls.

The Low Frequency Station houses two low frequency loudspeakers.

The Instructor Operator Station provides the IOS operator with the necessary controls and displays to effectively control, monitor, communicate, and evaluate a helicopter deck landing (HDL) training exercise.

The Trainee Pilot Station provides a crew station for the pilot to be trained in a virtual environment. The station is equipped with a head-mounted display (HMD) with headset, pilot seat, cyclic pitch stick, collective pitch lever and tail rotor pedals housed on an electric motion base.

The Second Pilot Station provides a crew station for the pilot to assist in training a trainee pilot in a virtual environment. The station is equipped with a head-mounted display (HMD) with headset, pilot seat, and controls for the landing gear.

The Landing Signals Officer (LSO) Station provides a crew station for an operator to act as the LSO while training a pilot in a virtual environment. The station is equipped with a head-mounted display (HMD) with headset and a mock-up of the LSO console including active switches and levers.

The Equipment Rack Station2 houses video distribution equipment.

The Motion Platform Power Station provides power supply and power control equipment for the Motion Platform Subsystem.

The Equipment Rack Station1 houses the Motion Platform Control Computer, voice mixer, and sound generation equipment.

The Medium Frequency Station houses two medium frequency loudspeakers on a stand.

The Audio Communication Subsystem Station provides the necessary facilities for the IOS operator and the pilot trainee to exchange audio communications during a training exercise.

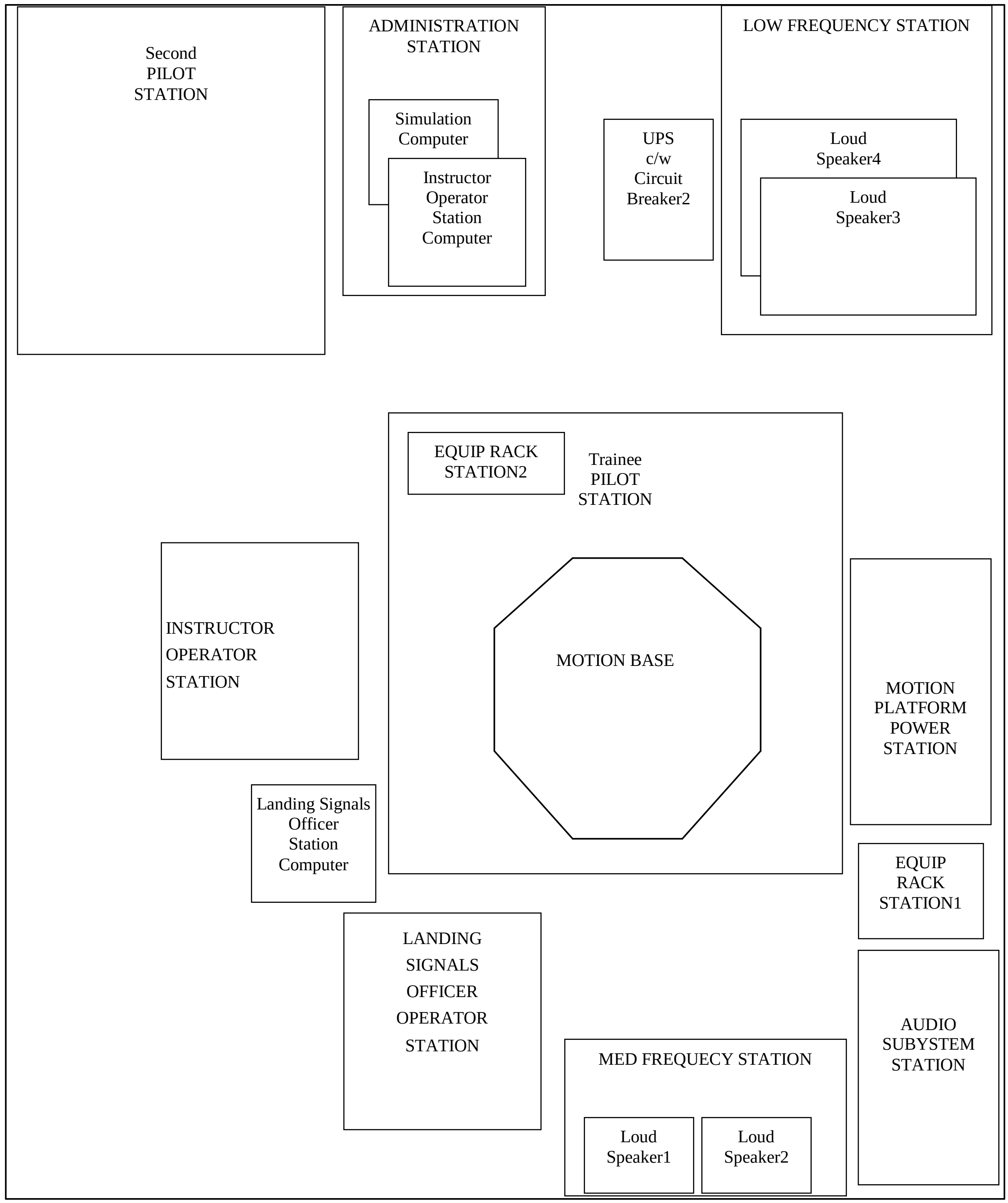


Figure 1 Simulator Floor Plan

3.2 System Overview

3.2.1 Background

Currently, Canadian Forces (CF) pilots flying the Sea King helicopter learn to land on the flight deck of a CPF through practice at sea. Although the training community has used a Sea King helicopter simulator at CFB Shearwater for more than thirty years, it does not have a visual display and, consequently, cannot be used for training visually guided tasks. Modern simulators are available with non-HUD visual displays, but they are expensive to procure and maintain. The acquisition cost of a typical commercial simulator can exceed $20 million Canadian. Although expensive, high-end simulators are cost-effective for some training operations when the high costs and risks associated with operational training are considered. However, the large acquisition price, the high maintenance costs, the small maritime pilot population, and limited Sea King lifespan, as well as geographical considerations, are likely factors that dissuade the purchase of high-end simulators for training deck landing skills.

In 1994, DRDC Toronto was requested by CF to investigate the potential use of low cost, virtual reality technologies for this purpose, following a successful demonstration of these technologies for training ship handling skills and reductions of sea time.

Landing on the deck of a CPF in high sea states is considered one of the most challenging visually guided tasks performed by any helicopter pilot in the CF. It requires fine motor skills, exceptional judgement, and precise manoeuvring techniques. Moreover, good depth perception is an essential element and a necessity for this task as the helicopter blades are within 5 metres of the ship's hangar face in the properly landed position. The physics-based modelling aspects are also formidable challenges, since, in addition to the aerodynamic modelling of the Sea King, the modelling of the ship's dynamics, interactions with the wind as affected by the ship's superstructure, as well as modelling of the undercarriage and its contact with the deck surface must be included.

The simulator design goals are to include affordability, portability, modularity, and low maintenance. Low cost can be partially achieved by employing commercial off-the-shelf (COTS) components intended for the entertainment market, rather than components specialized for high-end simulators.

A detailed description of the HelMET/HDLS development can be found in [References a, b].

3.2.2 HelMET System Description

The simulator design builds on common COTS components supplemented with specific aircraft parts from the Sea King helicopter. The Pilot Station includes an adjustable Sea King seat and primary flight control equipment that is linked to the Simulation Computer Subsystem and other various subsystems for sensory cueing. The Simulation Computer Subsystem, flight control components, and other subsystems are further discussed, along with their general characteristics. The pilot's flight controls, including tail rotor pedals, collective pitch lever and cyclic pitch stick, were obtained from the CF supply system or were built from technical drawings. Sensory cues are provided by a visual subsystem, motion platform subsystem, and sound and vibration subsystems. Control of pilot training is conducted via the Instructor Operator Station and Audio Communication Subsystem.

The simulator system block diagram is shown in

Figure 2. The simulator consists of the following major subsystems [References a, b]:

- Motion Platform Subsystem
- Flight Control Component Subsystem
- Visual Subsystem
- Video Distribution Subsystem
- Sound Subsystem
- Vibration Subsystem
- Audio Communication Subsystem
- Simulation Computer Subsystem
- Instructor Operator Station Subsystem
- Landing Signals Officer Station Subsystem
- Local Area Network.

The Motion Platform Subsystem, a six-degree of freedom (DOF) motion base unit, provides the necessary motion cues (roll, pitch, yaw, heave, surge, and sway) for a simulated helicopter.

The Flight Control Component Subsystem provides user control interfaces to three unique flight control characteristics: the vertical control, the horizontal control, and the heading control.

The Visual Subsystem provides the pilot with a view of the simulated environment. It consists of a head tracking device, an image generator, and a head-mounted display. The head tracking device determines the position and orientation of the pilot's head, which is used to determine his/her point of view. These measurements are passed to the image generator that renders the images within this field of view (FOV) and transmits the images to the Video Distribution Subsystem.

The Video Distribution Subsystem accepts display images in RGB video signals from the image generator and distributes images to the HMD display for pilot viewing and the IOS display repeater for instructor viewing.

The Sound Subsystem drives the sound and vibration subsystems' speakers and delivers continuous auditory cues as a function of the Sea King's simulated flight regime based on data received from the Simulation Computer Subsystem.

Similar to the Sound Subsystem, the Vibration Subsystem provides continuous cues to supplement the Motion Platform Subsystem. The Vibration Subsystem provides the higher frequency vibration environments that are not normally provided through the Motion Platform Subsystem.

The Audio Communication Subsystem provides the necessary audio communication interfaces between the pilot and IOS operator.

The Simulation Computer Subsystem executes the helicopter simulation model and management utilities, uses the pilot's controls to calculate the motion dynamics, determines the pilot's point of view from tracking head movements, and generates the graphics for the pilot's visual display and the Instructor Operator Station repeater monitors.

The Instructor Operator Station communicates with the Simulation Computer Subsystem for the simulation control.

The Landing Signals Officer Station communicates with the Simulation Computer Subsystem for the simulation status and provides the Landing Signals office with visual representation of the virtual scene. It also accepts input via the LSO console and provides this data to the simulation computer to update the simulation...

The Local Area Network provides communication among the five major computers (Motion Platform Control Computer, Simulation Computer, IOS Computer, LSO Computer, Audio Subsystem Computer 1 – Digital Audio Conferencing and Audio Subsystem Computer 2 – Digital Audio Conferencing & Effects) that host the applications software for the simulation.

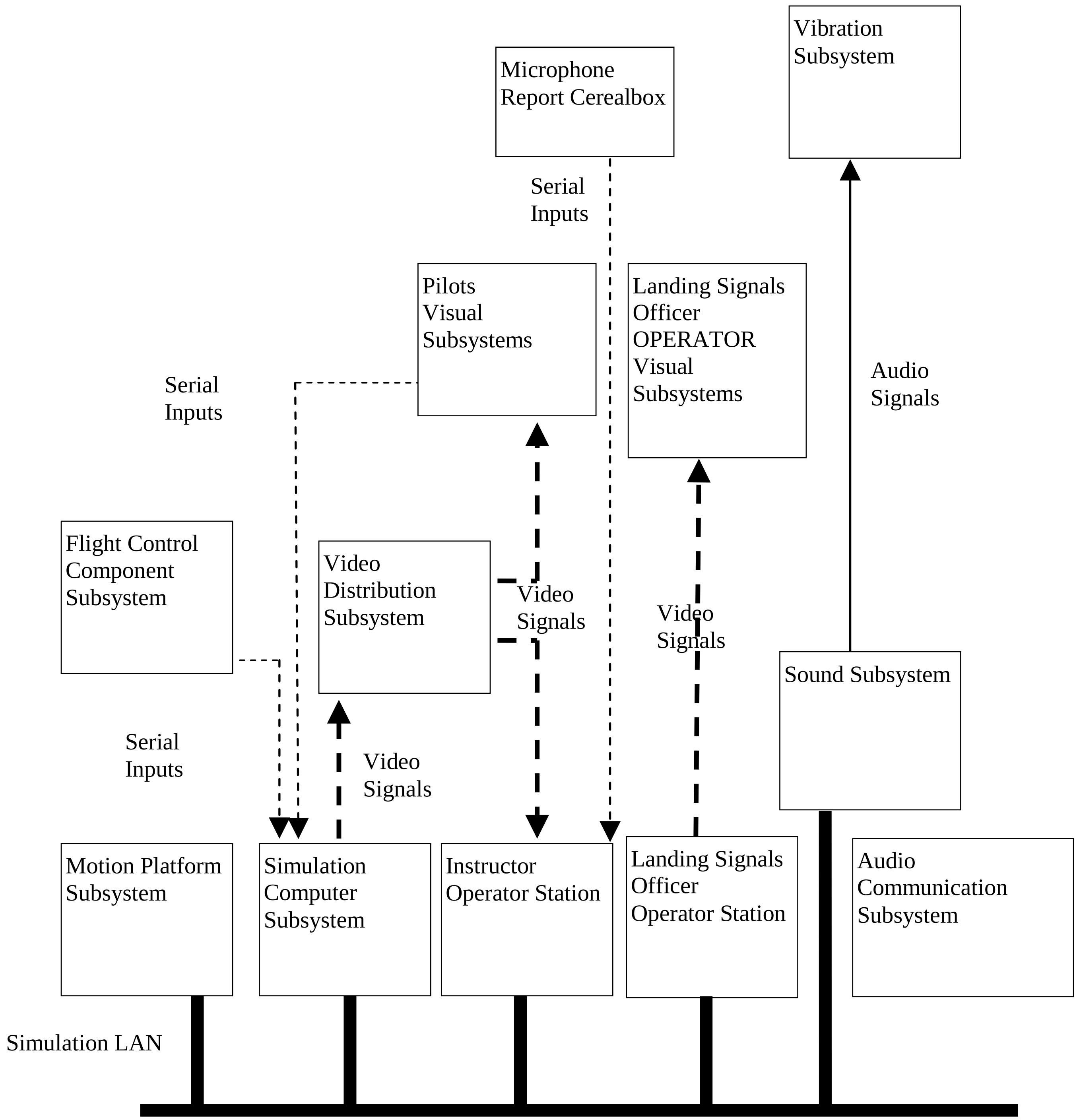


Figure 2 Simulator System Block Diagram

3.2.3 Hardware Configuration Items

The simulator consists of the following major Hardware Configuration Items (HWCIs):

- Motion Platform Subsystem
- Flight Control Component Subsystem
- Visual Subsystem
- Video Distribution Subsystem
- Sound Subsystem
- Vibration Subsystem
- Audio Communication Subsystem
- Simulation Computer Subsystem
- Instructor Operator Station Subsystem
- Landing Signals Officer Station Subsystem
- Local Area Network.

3.2.3.1 Motion Platform Subsystem

The Motion Platform Subsystem, a six DOF motion base unit from Servos and Simulation, Inc., provides the necessary motions (roll, pitch, yaw, heave, surge, and sway) for a simulated helicopter platform. It consists of the following major components:

- Power Supply Switch Box
- Power Control Panel
- Motion Platform Base Assembly
- Motion Platform Control Computer.

Table 1 provides a summary of the dynamic, mechanical, and electrical specifications.

Table 1 Motion Platform Dynamic, Mechanical, and Electrical Specifications

Item	Description
Dynamic:	
Limit of Motion (Roll)	+/- 18º
Limit of Motion (Pitch)	+/- 18º
Limit of Motion (Yaw)	+/- 18º
Limit of Motion (Heave)	+/- 0.114 m (+/- 4.5 in)
Limit of Motion (Surge)	+/- 0.127 m (+/- 5 in)
Limit of Motion (Sway)	+/- 0.127 m (+/- 5 in)
Limit of Velocity (Roll)	+/- 60º per second
Limit of Velocity (Pitch)	+/- 60º per second
Limit of Velocity (Yaw)	+/- 60º per second
Limit of Velocity (Heave)	+/- 0.762 m/sec (+/-30 in/sec)
Limit of Velocity (Surge)	+/- 0.762 m/sec (+/-30 in/sec)
Limit of Velocity (Sway)	+/- 0.762 m/sec (+/-30 in/sec)
Limit of Acceleration (Roll)	+/- 140º per sec per sec
Limit of Acceleration (Pitch)	+/- 140º per sec per sec
Limit of Acceleration (Yaw)	+/- 140º per sec per sec
Limit of Acceleration (Heave)	1.0 g

Item	Description
Limit of Acceleration (Surge)	1.0 g
Limit of Acceleration (Sway)	1.0 g
Mechanical:	
Payload Weight	908 kg (2,000 lb)
Payload Centre of Gravity	Centred on the Motion Frame
Motion Frame Standard Dimensions	Rectangle 0.635 m x 0.914 m (26 in x 36 in)
Floor Frame Standard Dimensions	2.134 m (84 in) circular footprint
Standard Height	0.787 m (31 in) to the top of the motion frame
Standard Weight	908 kg (2,000 lb)
Electrical:	
Standard Analog Input	6 signals, +/- 7.5 VDC each
Motors	Six 5 HP AC motors
Electrical Power	220 VAC, 50/60 Hz, 3 Phase, 90 amps
Connectors	Industrial quality connector furnished

3.2.3.1.1 Power Supply Switch Box

The Power Supply Switch Box from the installation facility provides 220 VAC, 50/60 Hz, three-phase power to the Motion Platform Subsystem.

3.2.3.1.2 Power Control Panel

The Power Control Panel (also known as the Electrical Power Distribution and Control Enclosures), a 0.92 m wide x 0.76 m high x 0.20 m deep NEMA type 12 unit, provides the necessary electrical power supplies to the Motion Platform Control Computer and Motion Platform Base Assembly. Single-phase 115 VAC is used to power to the Motion Platform Control Computer while three-phase 220 VAC is provided to power each of the six EMS motor drives. A 5 VDC power supply is used to power the Platform Table Assembly for the helicopter flight control components.

Each of the EMS motor drives is powered by a 15 Amp, three-phase circuit breaker and a solid state relay is located between the EMS motor drive and the circuit breaker such that electrical power to the Motion Platform Assembly may be remotely controlled by the Motion Platform Control Computer and four Power Off switches. Emergency stopping of the motion platform is available at two physical locations: the Motion Platform Power Control Panel location and the Motion Platform Control Computer System location. A Stop button is located at the Instructor Operator Station.

3.2.3.1.3 Motion Platform Base Assembly

The Motion Platform Base Assembly is composed of the top assembly, three leg assemblies, three leg assembly equipment covers, and three floor-mounting brackets that comprise the lower portion of the motion platform. The rectangular top assembly is used to house the Platform Table Assembly for the flight control components. The three leg assemblies are mechanically identical and differ only in the AC power and signal distribution. Each of the leg assemblies contains two motor/gearbox assemblies, two EMS motor drives, two angular displacement transducer position sensors, two sets of pushrods, and four capacitors used for energy storage. The motion platform is connected to the floor by three floor-anchoring brackets.

3.2.3.1.4 Motion Platform Control Computer

The Motion Platform Control Computer consists of the following major components:

- Motion Platform Computer
- Motion Platform Display Monitor
- Motion Platform Keyboard.

The Motion Platform Computer, an Advantech IPC-610 computer, is a 19 inch rack-mounted computer chassis for industrial applications with a 14-slot ISA or ISA/PCI backplane for the central processing unit (CPU), and input and output boards. It is used to control the six degrees of freedom motion platform.

A summary of physical and environmental specifications of the Motion Platform Computer is shown in Table 2. The computer is equipped with the following standard computer peripherals:

- A 100 MHz Pentium Single Board Computer (SBC) mounted in slot 1 of the passive backplane chassis
- A 8 Mbytes Flash Disk
- One 3.5 inch Hard Disk Drive and one 3.5 inch Floppy Disk Drive
- One VGA Display Monitor
- One standard keyboard
- One RS-232 serial port
- One Centronics parallel port
- One CIO-DDA06/12 Digital I/O board for communicating with the SBC
- One CIO-RELAY08 Relay board.

The CIO-DDA06/12 Digital I/O board from Computer Boards, Inc. is a 12-bit digital-to-analogue converter (DAC) card that is used to convert digital data into analogue signals that drive each of the six legs on the motion platform. The CIO-RELAY08 Relay board from Computer Boards, Inc. provides eight relays in 8 Form C contact sets.

The Motion Platform Display Monitor, model TTX-3402, is a standard 14 inch display monitor for PC applications. The Motion Platform Keyboard is a standard PC keyboard.

Table 2 Advantech IPC-610 Physical and Environmental Specification

Item	Description
Computer - Width	0.482 m
Computer - Height	0.177 m
Computer - Depth	0.452 m

Item	Description
Weight	17.5 kg
Colour	PANTONE 414U
Construction	Heavy-duty steel
Cooling Fans	One 86 CFM cooling fan with air filters
Operating Temperature	0º C to 50º C
Relative Humidity	5 to 95 %, non-condensing

3.2.3.2 Flight Control Component Subsystem

The Flight Control Component Subsystem provides interfaces to simulate three unique flight control characteristics: the vertical control, the horizontal control, and the heading control. It consists of the following major items:

- Platform Table Assembly
- Collective Pitch Lever
- Cyclic Pitch Stick
- Tail Rotor Pedals
- Pilot Seat
- Flight Control CerealBox.

3.2.3.2.1 Platform Table Assembly

The Platform Table Assembly, approximately 1.4 m (long) by 0.9 m (wide), is a DRDC-designed plate assembly to house the Primary Flight Control Component Subsystem equipment and various positioning devices.

NOTE

With electrical power removed, the moveable platform remains in position largely due to the capacitors and the friction of the spherical bearings on the adjoining links. Once the capacitors are discharged, if sufficient forces are imposed to overcome this friction, the platform will move towards its parked position. If the platform power is lost and the platform is not in its parked position, stepping on it will likely cause it to move and become unstable. Therefore, if power is removed, ensure that the platform is moved to its parked position before mounting or dismounting of the moveable platform.

3.2.3.2.2 Collective Pitch Lever

The main rotor flight controls provide both vertical and directional control. The collective pitch lever located in the left side of the pilot seat is the primary vertical control for the main rotor. Vertical control is accomplished by changing collectively the pitch (angle of incidence) of the main rotor blades. This increases or decreases the angle of attack of all the blades simultaneously and, consequently, the tilt or vertical thrust developed.

WARNING

Emergency momentarily stopping of the platform motion is available on the pilot's collective pitch lever as a switch. To stop the platform movement with this switch, press and hold the collective pitch lever switch for more than 3 seconds. Note that the activation of this switch will only remove the platform motion entirely if held. As soon as the switch is released, the platform will be in motion. Since this switch must be held to keep the motion platform inactive, it is preferred that operationally the Stop button on the Instructor Operator Station be used.

The preferred method of removing the platform motor drive power is to use the Stop button on the Instructor Operator Station or, if necessary, the Emergency Stop button located on the Electrical Power Control Panel.

3.2.3.2.3 Cyclic Pitch Stick

The cyclic pitch stick located in front of the pilot seat is the primary horizontal control for the main rotor. Directional control is accomplished by tilting the main rotor that produces a directional thrust in that direction. The rotor is tilted by changing the pitch of each blade individually as it makes a complete rotation. The cyclic pitch change causes the blade to climb or dive as it rotates, causing the vertical axis to tilt in the desired direction.

NOTE

The cyclic’s Trim Release button does not function in the same manner as on the actual Sea King, CH124. The cyclic’s Trim Release button on the Pilot Station resets the sum of the trim inputs, as commanded by the pilot, since the start of the session. Thus pressing the Trim Release button will return the synthetic trim to the state that it was when the mission commenced. The parameters selected, at the start of a session, for ambient wind will affect the initial position (or datum) referenced by the synthetic trim.

3.2.3.2.4 Tail Rotor Pedals

The tail rotor pedals are located on the Pilot Station Platform Table Assembly in front of the pilot seat. The tail rotor pedals change the pitch and thrust of the tail rotor and, consequently, the heading of the helicopter. Pressing the left-hand pedal increases the tail rotor blade pitch, which increases thrust, and turns the helicopter to the left. Pressing the right-hand pedal decreases the tail rotor blade pitch, which decreases thrust, and turns the helicopter to the right.

3.2.3.2.5 Pilot Seat

The pilot seat is mounted on rails that allow adjustment fore and aft. It includes seat height adjustment and a four-point safety restraint harness as well as a five-point emergency backpack that is used for padding.

3.2.3.3 Flight Control CerealBox

The Flight Control CerealBox unit provides the necessary interfaces to the collective pitch lever, cyclic stick grip and tail rotor pedals. The pilot's helicopter control inputs are digitally transmitted to the Simulation Computer on serial I/O connections. The interface unit is an analogue-to-digital and serial converter box, known as CerealBox from B. G. Systems. The CerealBox physical dimensions are 10 cm x 13 cm x 3 cm and the weight is 0.28 kg. The LV824 CerealBox is an eight analogue input, 24 digital input device that provides sampled data from analogue and digital devices and transfers sampled data to the serial (RS-232) port of the Simulation Computer Subsystem. The analogue input channels can be programmed individually for different input voltages (0 to +5, -5 to +5, 0 to +10, and –10 to +10 VDC). The CerealBox can support baud rates between 2,400 and 115,200.

3.2.3.4 Microphone Report Cerealbox

The Microphone report CerealBox unit provides the necessary interfaces to the microphone switches at both pilot positions. The pilot's microphone inputs are digitally transmitted to the Instructor Operator Computer on serial I/O connections. The interface unit is an analogue-to-digital and serial converter box, known as CerealBox from B. G. Systems. The CerealBox physical dimensions are 10 cm x 13 cm x 3 cm and the weight is 0.28 kg. The LV824 CerealBox is an eight analogue input, 24 digital input device that provides sampled data from analogue and digital devices and transfers sampled data to the serial (RS-232) port of the Instructor Operator Computer Subsystem. The analogue input channels can be programmed individually for different input voltages (0 to +5, -5 to +5, 0 to +10, and –10 to +10 VDC). The CerealBox can support baud rates between 2,400 and 115,200.

3.2.3.5 Visual Subsystem

The Visual Subsystem provides the pilots with a view of the simulated environment. It consists of the following major components:

- Head Tracking Device
- Image Generator
- Head Mounted Display (HMD).

The Head Tracking Device determines the position and orientation of the pilot's head and is used to determine his point of view. These measurements are passed to the Image Generator that renders the images within this field of view (FOV) and transmits the images to the Video Distribution Subsystem. The Video Distribution Subsystem distributes images to the Head Mounted Displays for pilots viewing and the Instructor Operator Station for instructor viewing.

3.2.3.5.1 Head Tracking Device

The head tracking device control inputs are digitally transmitted to the Simulation Computer on serial I/O connections. A six DOF head tracking device, Polhemus 3 SPACE FASTRAK II, is used to sense the pilot’s head position and orientation within a half-dome, electromagnetic field. It is based on generating near field, low frequency, magnetic field vectors from the transmitter that is a single assembly of three co-located, stationary antennas. The receiver, a single assembly of co-located, remote sensing antennas, detects the magnetic field vectors. The detected signals are input to a mathematical algorithm that computes the receiver’s position and orientation relative to the transmitter.

Table 3 provides a summary of the 3 SPACE FASTRAK II physical specifications. The 3 SPACE FASTRAK II consists of the following major components:

- System Electronics Unit (SEU)
- Transmitter

- Receiver
- Power Supply.

The SEU contains the hardware and software necessary to generate and sense the magnetic fields, compute position and orientation, and interface with the Simulation Computer via a serial RS-232 interface.

The transmitter is a triad of electromagnetic coils (enclosed in a plastic shell) that emits the magnetic fields. It is the system's reference frame for receiver measurements.

The receiver is a small triad of electromagnetic coils (enclosed in a plastic package) that detects the magnetic fields emitted by the transmitter. As the receiver moves with its attached cube, its position and orientation are precisely measured.

The 3 SPACE FASTRAK II can provide position and orientation with a static accuracy of about 0.08 cm RMS and a resolution of 0.0005 cm/cm at 4 ms latency (for a receiver/transmitter separation of less than 76.2 cm.). These data are transmitted to the Simulation Computer at a data rate of 38.4K baud and updated at 120 Hz for a single receiver configuration.

In the simulator configuration, the transmitter is positioned above the pilot's head by two converging arches that project upward from the top of the pilot's seat. The arches are made of wood to avoid electromagnetic interference. The Receiver is mounted on the top of HMD. The processed receiver data are transmitted to the Image Generator via a RS-232 serial interface and used to determine the eye viewpoints for the computer-generated visual display.

Table 3 Polhemus 3 SPACE FASTRAK Physical Characteristics

Item	Description
SEU Dimensions	0.29 m (L) x 0.29 m (W) x 0.09 m (H)
SEU Weight	2.26 kg
Power Supply Dimensions	0.178 m (L) x 0.94 m (W) x 0.559 m (H)

Item	Description
Transmitter Dimensions	0.584 m (L) x 0.559 m (W) x 0.559 m (H)
Receiver Dimensions	0.229 m (L) x 0.279 m (W) x 0.152 m (H)
Operating Temperature	10º C to 40º C
Relative Humidity	10 % to 95 %
Power Requirements	25 W, 90-250 VAC, 38-65 Hz

3.2.3.5.2 Image Generator

The Image Generator generates the visual representations of the helicopter cockpit and exterior scene from the pilots' perspectives. The visual representation of simulated exterior scene includes the earth horizon, ocean surface, and several landmarks on the CPF platform rear deck as viewed from the pilots' seats through the windows of the Sea King helicopter.

The Pilot image generation is accomplished by the Simulation Computer, which is a Concurrent Imagen computer with 2 NVIDIA Quadro FX 5500 graphics cards. These graphics cards can each drive a stereo 1280 x 1024 Head mounted Display. The software rendering pipelines are each split into three major pieces to handle critical path operations for (i) specification of viewpoint and object positions, (ii) level of detail (LOD) management, view frustum culling, sorting, and (iii) the final rendering of the scene. The multi-threaded, parallel pipelines for per-frame scene management and image generation for graphics rendering drive the stereo projection images. The image generator affords a full field of regard, limited only by the visual representation of obstructions of the aircraft.

The Simulation Computer Subsystem (Concurrent Imagen) provides four independent graphical channels, one for each eye for each of the two stereo HMDs. It renders all components of the visual environment, including the sea surface and ship details. The scene refresh rate is non-interlaced. The scenes are constructed from coloured, textured polygons. About 6,000 to 8,000 polygons compose each scene. The run-time and real-time profiling with built-in delay rate ensures smooth graphics scene transitions and generation at a rate of 60 frames/second.

3.2.3.5.3 Head Mounted Display

The HMD, a NVis NVisor SX60 device, provides stereoscopic images for the pilot. The NVisor SX60 consists of the following major components:

- NVisor SX60 HMD
- NVisor SX60 Control Box
- Universal Power Supply.

The NVisor SX60 HMD has dual ferroelectric liquid crystal on silicon displays (FLCOS). Each display has a 48° horizontal by 36° vertical FOV, with a 1280 x 1024 x 3 pixels with 100% overlap and 2.25 arc minutes/pixel, with a triad pixel structure, contrast ratio about 200:1, and weight of 0.964 kg. The HMD overall dimensions are 0.43 m (length) x 0.2 m (width) x 0.15 m (height).

The NVisor SX60 HMD will visually go blank momentarily at times when the software cannot update the visuals due to situations such as the motion platform engaging or the database loading.

The NVisor SX60 control box accepts two 60 Hz, non-interlaced input signals in super extended video graphics adapter (SXGA) format and outputs to the NVisor SX60 display. The images are conveyed to the HMD by means of a Small Computer Standard Interface (SCSI) connector that runs from the NVisor SX60 Control Box that is in turn connected to the Video Distribution Subsystem with VGA video signal cables. The length of each video signal cables is about 3 metres. The length of the SCSI cable is about 3 metres; it runs up from the centre of the motion base to the top of the seat.

The adjustable suspension system of the NVisor SX60 HMD consists of two bands at right angles to one another. A horizontal band surrounding the sides and back of the head allows the eyepieces to be tightened against the observer's brow with an adjustable ratchet. A vertical band that crosses from ear to ear allows the eyepieces to be raised or lowered to match the observer's line of sight. Eye relief is adjusted by sliding adjustment knobs on each side of the NVisor SX60 HMD. These knobs can be used to move the AMLCD panels away from or toward the eyes. The eye relief is sufficiently large to allow the pilot to wear glasses. Optical alignment of the two images is accomplished by providing the pilot with an interior view of the Sea King helicopter and an exterior view of the ship's deck as it would appear from the helicopter when it is centred in the rapid securing device (RSD) and square with the ship. The pilot achieves binocular alignment of the images by alternately closing and opening each eye while looking forward and turning the inter-ocular adjustment knob so that a distant object appears centred to both.

3.2.3.6 Video Distribution Subsystem

The Video Distribution Subsystem accepts display images in VGA video signals from the Image Generator and distributes images to the HMD displays and the Instructor Operator Station display. It consists of Standard Video Distribution Amplifiers that are designed for use whenever a VGA video signal must be split into multiple outputs while signal quality throughout is maintained.

3.2.3.7 Sound Subsystem

The Sound Subsystem delivers continuous auditory cues as a function of the Sea King's simulated flight regime based on analogue audio outputs received from the Sound Subsystem Control Computer. The cockpit sound is a digital reproduction of analogue recordings made on a Sea King flight during hover and cruising at 120 knots. Simple linear models determine the pitch and volume levels based on the helicopter control inputs and airspeed conditions. These models together with recommendations by the pilots are used to drive two sound channels to enhance the pilot's immersion in a virtual flight.

The Sound Subsystem consists of the following major components:

- Equipment Rack
- Yamaha DEQ7 Digital Equalizer
- BSS FDS-36O Integrated Frequency Dividing and Limiter
- Medium Frequency Amplifier - Carver TFM-6CB 200 Watt Amplifier
- Low Frequency Amplifier - McIntosh MC 2205 200 Watt Power Amplifier
- Medium Frequency Loudspeakers
- Low Frequency Loudspeakers.

Figure 3 shows the Sound and Vibration subsystem functional block diagram. Table 4 provides a summary of the Sound Subsystem physical and electrical specifications. The Sound Subsystem Control Computer drives the sound and vibration via an analogue output. It sends the audio signal to the Yamaha DEQ7 digital equalizer and BSS FDS36O frequency divider for shaping and separating the low frequency and mid range audio signals with the 3 dB crossover set at approximately 80 Hz. The mid frequency ranges are amplified by the Carver TFM-6CB 200-watt amplifier into DRDC-designed medium frequency loudspeakers, and the low frequency signals are fed to the low frequency loudspeakers.

Table 4 Sound Subsystem Physical and Electrical Specifications

Item	Power	Physical	Weight
Equipment Rack	N/A	1.42 m (H) x 0.52 m (W) x 0.64 m (D)	35 kg
Yamaha DEQ7	120 VAC, 30 W	0.045 m (H) x 0.48 m (W) x 0.29 m (D)	3.7 kg
BSS FDS-360	110-220 V, 50/60 Hz	0.044 m (H) x 0.482 m (W) x 0.228 m (D)	4.5 kg
Carver TFM-6CB	230 W at full power	0.03 m (H) x 0.48 m (W) x 0.32 m (D)	6.36 kg
McIntosh MC 2205	200 W/channel, 400 W mono	0.18 m (H) x 0.42 m (W) x 0.37 m (D)	38.6 kg
Medium Frequency Loudspeakers	N/A	0.46 m (H) x 0.36 m (W) x 0.21 m (D)	24 kg
Low Frequency Loudspeakers	N/A	1.22 m (H) x 0.8 m (W) x 1.22 m (D)	60 kg

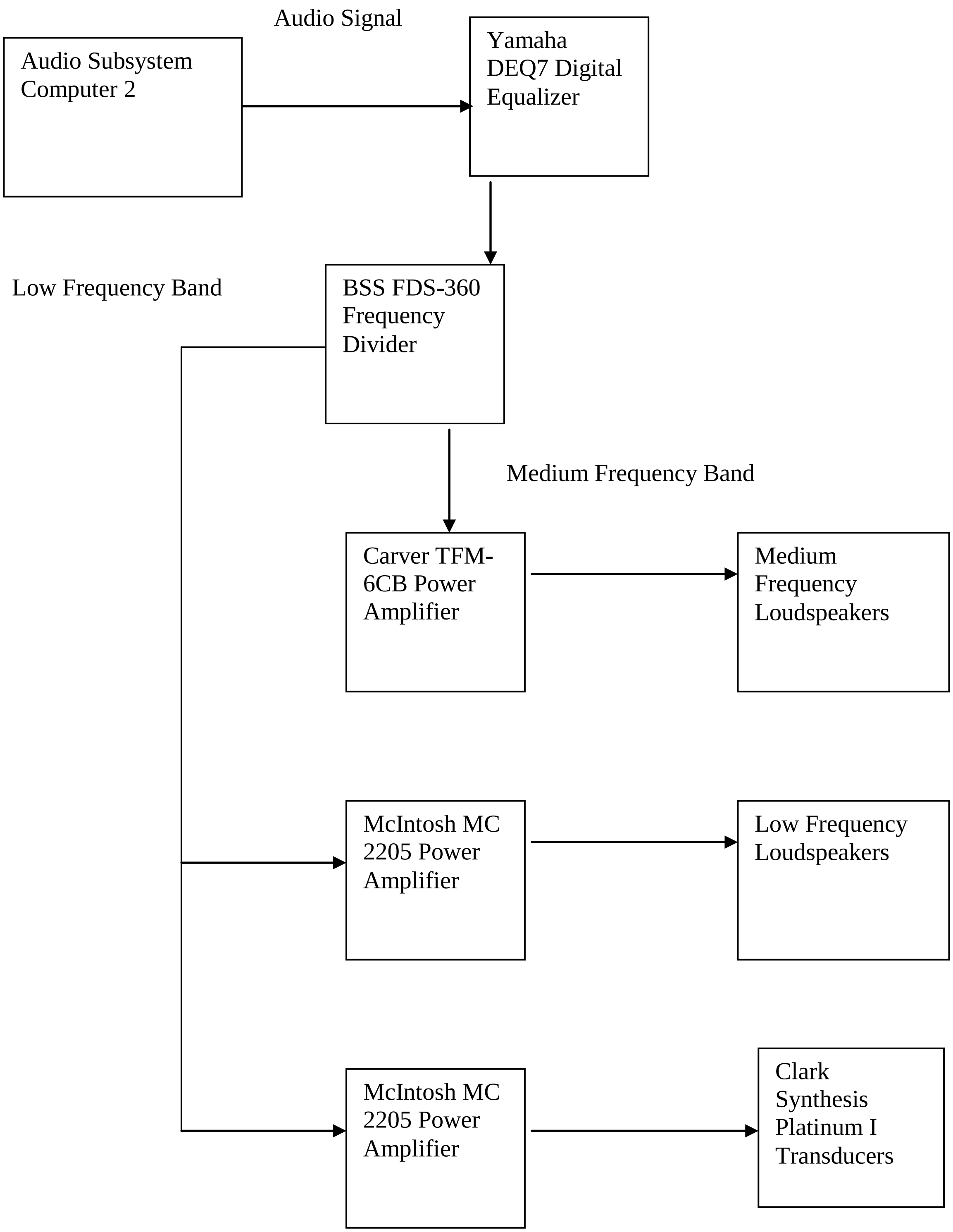


Figure 3 Sound and Vibration Subsystems Functional Block Diagram

The Yamaha DEQ7 Digital Equalizer employs the advanced Yamaha digital signal processing technology to provide precise, stable equalization in a wide variety of formats. There is a selection of graphic EQ types, parametric EQ, tone controls, band pass and band rejection filters, and a range of unique dynamic EQ programs. Any of the preset EQ programs can be edited and stored in any of 60 random access memory (RAM) locations for instant recall and use. The DEQ7 Digital Equalizer provides the following key features:

- Graphic 4 band parametric tone control, band pass, band reject, notch filter, and dynamic equalizer options
- Separate left and right settings or left = right
- Independent left and right time alignment delay and level on every programme
- Lock-out programme protection function.

The BSS FDS-360 Integrated Frequency Dividing and Limiter System is a stereo two-way or mono three or four-way fixed frequency fourth order crossover. The FDS-360 enables accurate control of loudspeaker power, dispersion and acoustical summation around the critical crossover region. It provides the following main features:

- Stereo two-way mode or switchable three/four-way mono mode
- Separate frequency band limiters matched to the precise band of frequencies controlled
- Separate polarity switching for each band
- LED signal level monitoring
- Band insertion points for interfacing external equalization and time delay units
- Band-edge phase adjustment allowing 360 degrees of control
- Crossover filter programming via plug-in frequency cards allowing any frequency, choice of 12/18/24 dB per octave slopes and filter responses to be specified. 24 dB/octave Linkwitz-Riley responses are provided as standard.
- Internal equalization option.

The Carver TFM-6CB provides loop-through outputs for “daisy-chaining” connection, input-level controls and a mono-mode. It provides the following major features:

- Two channel stereo or bridged mono switch
- All discrete circuitry throughout
- Left/right level controls
- A/B speaker selection
- Additional outputs for multiple amplifier connection.

The McIntosh MC2205 Stereo Power Amplifier provides the switching for two channel stereo or bridged mono.

3.2.3.8 Vibration Subsystem

Similar to the Sound Subsystem, the Vibration Subsystem provides continuous cues to supplement the motion systems. This Vibration Subsystem provides the higher frequency vibration environments (usually 3 to 20 Hz) that are not normally provided through platform motion systems. This Vibration Subsystem aids immersion into the synthetic environment by providing vibrations related to rotor blade functioning and speed conditions that the pilot could sense by no other means. The vibrations also serve to mask the unwanted stepping response characteristic of electric drives; a feature not normally present in large hydrostatic, hydraulic motion bases. Low pass outputs of the analogue recordings made on a Sea King helicopter flight during hover and cruising at 120 knots are used to drive the actuators and provide the vibration cues. Two types of actuators are used in this simulation; piezoelectric transducers attached to the pilot seat and large speakers.

The Vibration Subsystem consists of the following major components:

- McIntosh MC2205 200 Watt Power Amplifier
- Clark Synthesis Platinum I Transducers.

Table 5 Vibration Subsystem Physical and Electrical Specifications

Item	Power	Physical	Weight
McIntosh MC2205	200 W/channel, 400 W mono	0.18 m (H) x 0.42 m (W) x 0.37 m (D)	38.6 kg
Clark Synthesis Transducers	N/A	0.2 m (Diameter) x 0.06 m (Height)	0.77 kg

The Audio Subsystem Computer 2 provides an analogue audio output to the primary Sound Subsystem. This primary simulation sound is frequency divided and shaped to provide two low frequency vibrating modes. One mode of low frequency vibration is provided by the McIntosh MC2205 200 watt power amplifier into the sub-woofers providing the roar of the engines and transmitted as vibration to the pilot's body environment. These bass reflex speakers are mounted approximately 2.4 m to the rear of the seat structure to provide full body environmental vibration. The second mode of low frequency vibration is provided by another McIntosh MC2205 200 watt power amplifier feeding two Clark Synthesis tactile sound transducers; one mounted midway up the back of the pilot seat lateral to the midline (approximately 0.36 m from the seating surface and 0.12 m off midline) and the second mounted on the underside of the seating surface (approximately 0.2 m. from the rear, in the midline).

3.2.3.9 Audio Communication Subsystem

The Audio Communication Subsystem provides the necessary audio communication interfaces between the pilot and the IOS operator. The IOS operator communicates directly with the pilot on an audio communication channel via a headset with an integrated microphone. While the IOS operator's headset is worn as an over-the-head-mounted device, the pilot's headset mounting is integrated with the NVisor SX60 HMD.

The Audio Communication Subsystem provides analogue voice communication. The main analogue voice communication device is the Mackie 1202-VLZ PRO, which is a 12 channel compact mic/line mixer.

The digital Audio Subsystem consists of the following items:

- Audio Subsystem Computer 1 – Digital Audio Cues with a headset microphone
- Audio Subsystem Computer 2 – External Sound effects and Vibration

Each Communication Subsystem Computer consists of the following major components:

- Audio Communication Subsystem Computer
- Display Monitor
- Keyboard
- Mouse.

The Audio Subsystem Computer is a Dell Dimension 4100 desktop computer. The mid-size tower computer system is based on the Intel 815E chip set with support for 133 MHz memory, 4xAGP graphics, and Ultra ATA/100 hard drives. The basic Dimension 4100 computer is configured with a Pentium III/930 MHz CPU, 512 MB of DRAM, a 40 GB hard drive, 3.5 inch floppy disk drive, 48X CD-ROM drive, a 64 MB graphics card, and a sound card.

The display monitor, Model UltraScan P991, is a 19 inch colour display monitor. The keyboard, Model No. SK-8000, is a Dell Quiet Key standard keyboard. The pointing device is a Microsoft IntelliMouse, Part No. X04-721167.

3.2.3.10 Simulation Computer Subsystem

The Simulation Computer Subsystem executes the helicopter simulation management utilities, uses the pilot's controls to calculate the motion dynamics, determines the pilots' point of view from tracking head movements, and generates the graphics scenario for the pilot's visual display and the Instructor Operator Station repeater monitors. It also communicates with the IOS Computer, LSO Computer, Motion Platform Control Computer, Audio Subsystem Computer 1 and Audio Subsystem Computer 2.

The Simulation Computer Subsystem is a Concurrent Imagen computer with 2 NVidia Quadro FX 5500 graphics cards. The four dual-core AMD processor Concurrent Imagen running RedHawk Linux executes the simulation management utilities. This Simulation Computer uses the outputs of the pilot's controls as inputs to drive the software simulating the flight dynamics and together with prevailing environmental conditions, direct the movements to the Motion Platform Control Computer via the Ethernet connection.

The helicopter aerodynamics model developed by the University of Toronto Institute for Aerospace Studies (UTIAS) is used to simulate the aerodynamics of the Sea King. The Simulation Computer receives digital data from the primary flight controls, including the tail rotor pedals, collective pitch lever, and cyclic pitch stick, for calculations of the flight and motion dynamics at update rates of 60 Hz. Platform motion dynamics are calculated and transmitted at this rate considering the primary flight data inputs in the aerodynamics model together with the environmental variables. Environmental variables include turbulent gust over the helicopter rotor disk, and air wake to represent aerodynamic disturbance around the ship.

The main loop of the simulation program operates at a rate of 60 Hz and directs the motion base playback vectors for rotations and translations of the motion base to simulate the Sea King flight dynamics. It also communicates with the IOS Workstation, which is responsible for controlling the simulation.

The Simulation Computer Subsystem consists of the following major components:

- Uninterruptible Power Source (UPS)
- Simulation Computer
- Display Monitor
- Keyboard
- Mouse.

The UPS, a Matrix 5000 from American Power Conversion, is a high-power enhanced line interactive uninterruptible power source designed to provide clean, reliable AC power to the Simulation Computer.

The Simulation Computer, a Concurrent Imagen system, is a high-performance workstation. The Imagen workstation is equipped with the following standard features:

- Four dual-core AMD processors.
- 16 gb ram
- Slots for additional boards
- Two NVidia Quadro FX 5500 graphics cards
- Three 250GB 7.2K SATA hard drives

The Colour Graphics Monitor, Model No. GDM-4011P, is a 20 inch colour display monitor. The keyboard, Model No. U.S. AT-101, is an industry standard PS/2 style keyboard. The mouse is an industry standard PS/2 style mouse.

Table 6 Simulation Computer Peripheral Specifications

Item	Conditions	Unit
APC Matrix UPS 5000	Length	0.45 m
	Width	0.35 m
	Height	0.45 m
	Weight	79.8 kg

Item	Conditions	Unit
APC SMARTCELL XR Battery	Length	0.46 m
	Width	0.18 m
	Height	0.23 m
	Weight	58 kg
SGI GDM-4011P Colour Display Monitor	Length	0.50 m
	Width	0.47 m
	Height	0.49 m
	Weight	27 kg
	AC Input Voltage	100 to 240 V, 50 – 60 Hz
	AC Current	1.2 – 1.7A
	Power Consumption	Max. 150 W

3.2.3.11 Instructor Operator Station

The Instructor Operator Station communicates with the Simulation Computer Subsystem for the simulation control. In addition to the initiation and scheduled termination of the simulation, emergency stopping of the motion platform is available at the Instructor Operator Station. The IOS operator controls the simulation and simulation flow via the Instructor Operator Station's main display monitor. The main display monitor usually displays two views, the operator’s and the pilot's. The operator's view consists of a pilot’s eye view of the simulation and selectable ship's heading, speed and co-ordinates. The pilot’s view consists of heading, horizon, air speed, and altitude.

The IOS Computer Subsystem consists of the following major components:

- IOS Computer
- Display Monitor
- Keyboard
- Mouse
- Auxiliary Display Repeater.

The IOS Computer is a Dell Precision WS530 Workstation system, in its day, a relatively high-performance workstation in a desktop enclosure. It has the following features:

- Two 1.75 GHz Xeon processors with 512MB RDRAM
- 3COM 10/100 Ethernet network interface card
- 40GB hard drive and a 20/40X CD-ROM.

The colour graphics monitor, SGI Model No. CM2198MSG, is a 21 inch colour display monitor. The keyboard, SGI Model No. RT6856T, is an industry standard PS/2 style keyboard. The mouse, SGI Model No. M-S43, is an industry standard PS/2 style mouse. The Auxiliary Display Monitor, a Sony Trinitron Model Multiscan 17e, is a 17 inch display monitor.

Table 7 IOS Peripheral Specifications

Item	Conditions	Unit
Sony Multiscan 17se1 Colour Graphics Monitor	Length	0.41 m
	Width	0.45 m
	Height	0.42 m
	Weight	23 kg
	AC Power Supply	100 to 120 V, 50/60 Hz, 2.7 A
		220 to 2400 V, 50-60 Hz, 1.5 A

3.2.3.12 Landing Signals Officer Station

The Landing Signals Officer (LSO) Station provides a crew station for an operator to act as the LSO while training a pilot in a virtual environment; however, in its most common current configuration, it serves only to provide an observer viewpoint reflecting the LSO perspective. The station is equipped with a head-mounted display (HMD) with headset and a mock-up of the LSO console including active switches and levers.

The LSO Computer Subsystem consists of the following major components:

- LSO Computer
- Display Monitor
- Keyboard
- Mouse
- Auxiliary Display Repeater.

The LSO Computer is a Dell Precision WS650 Workstation system, in its day, a relatively high-performance workstation in a desktop enclosure. It has the following features:

- Two 3 GHz processors with 3GB SDRAM
- 10/100 Ethernet network interface card
- 146GB hard drive with 48X CD-ROM and 32X DVD-CDRW.

The colour graphics monitor, SGI Model No. CM2198MSG, is a 21 inch colour display monitor. The keyboard, SGI Model No. RT6856T, is an industry standard PS/2 style keyboard. The mouse, SGI Model No. M-S43, is an industry standard PS/2 style mouse. The Auxiliary Display Monitor, a Sony Trinitron Model Multiscan 17e, is a 17 inch display monitor.

Table 8 LSO Peripheral Specifications

Item	Conditions	Unit

Item	Conditions	Unit
SGI Keyboard	Length	0.21 m
	Width	0.47 m
	Height	0.04 m
	Weight	1.0 kg
Sony Multiscan 17se1 Colour Graphics Monitor	Length	0.41 m
	Width	0.45 m
	Height	0.42 m
	Weight	23 kg
	AC Power Supply	100 to 120 V, 50/60 Hz, 2.7 A
		220 to 2400 V, 50-60 Hz, 1.5 A

3.2.3.13 Local Area Network

The Local Area Network (LAN) is achieved via Ethernet connections. It consists of the following major components:

- Simulation LAN with communication hub and cable connections

The Simulation LAN is a 3Com Office connect 10/100 hub eight ports. The Simulation LAN provides communication among the five major computers (Motion Platform Control Computer, Simulation Computer, IOS Computer, LSO Computer, Audio Subsystem Computer 1 and Audio Subsystem Computer 2 that host the applications software for the simulation.

3.2.4 Computer Software Configuration Items

The simulator software consists of the following two major Computer Software Configuration Items (CSCI):

- Commercial Off-The-Shelf (COTS) CSCI
- HDLS-SMART CSCI.

3.2.4.1 Commercial Off-The-Shelf CSCI

The COTS CSCI, a collection of commercial software packages, consists of the following major Computer Software Components (CSCs):

- Purchased COTS CSC
- Freeware COTS CSC
- Custom COTS CSC.

NOTE

The device's total software architecture interrelates the functions of different software modules. The software tool that calculates the flight dynamics properties of the synthetic helicopter is developed and auto-coded in "MATRIXx". The software module that facilitates the motion/behaviour properties of the synthetic ocean and ship dynamics is called "Fredyn". The software module that facilitates the image generation is called "Performer". A software module called "Robust Audio Tool" or "RAT" facilitates the digital voice audio conferencing between "Federates" or "Roles" such as the Pilot, LSO and IOS operator. The software module that facilitates the ambient sound, such as engine noise, is called "OpenAL". Some other functions, such as the lighting sequencing of the synthetic Haul-down panel, have been enabled by software developed by DRDC Toronto and are incorporated within the device's total software architecture.

3.2.4.1.1 Purchased COTS CSC

The Purchased COTS CSC consists of the following major software packages:

- MS/DOS Operating System
- RedHawk Linux Operating System
- OpenGL Performer for Linux
- CerealBox Driver.

3.2.4.1.1.1 MS/DOS Operating System

The MS/DOS Operating System, version 6.22 from Microsoft, is a Disk Operating System (DOS) for personal computers. This operating system is applicable to the Motion Platform Control Computer.

3.2.4.1.1.2 RedHawk Linux Operating System

RedHawk Linux 4.2.1 is a derivative of Red Hat Enterprise Linux (RHEL 4.0-4), closely following kernel and distribution releases of RHEL, and modified to guarantee system response times for hard and soft real-time applications. It runs on a Concurrent Computer Corporation Imagen Computer system which houses 4 Dual core AMD processors that is used as the simulation computer.

3.2.4.1.1.3 OpenGL Performer for Linux 3.1.1

OpenGL Performer for Linux Release 3.1.1 from SGI is a software development environment that supports programmers' implementation of high performance graphics applications on SGI products and most commercial computer video graphics cards. It offers both high level facilities for visual simulation and virtual reality tasks and an application-neutral high-performance hardware-oriented graphics toolkit. In the simulator, this software toolkit is used for creating real-time visual simulation and other 3D interactive graphics applications on commercial visual simulation systems that support OpenGL-based video graphics (including SGI, NVidia, and AMD). This provides the interface with advanced features to develop a sophisticated image generation system in a software environment. This software runs on all HelMET computers that display images from the Virtual World (Simulation, IOS, and LSO computers).

3.2.4.1.1.4 CerealBox Driver

The CerealBox Driver from BG Systems provides the necessary functions to configure and interface with the CerealBox hardware.

3.2.4.1.2 Freeware COTS CSC

The Freeware COTS CSC consists of the following major components:

- Red Hat Linux Operating System
- Parallel Virtual Machine
- DMSO HLA Run-Time Infrastructure (RTI)

3.2.4.1.2.1 Red Hat Linux Operating System

The Linux operating system with kernel, system software, and application software was originally developed for Intel x86-based PC's. The Linux Operating System release 8.0 from Red Hat is a Unix-like operating system for personal computers. This operating system is applicable to the IOS Computer, LSO Computer, Audio Subsystem Computer 1 and Audio Subsystem Computer 2.

3.2.4.1.2.2 Parallel Virtual Machine

The Parallel Virtual Machine allows a computer to spawn processes on another computer.

3.2.4.1.2.3 High Level Architecture Run Time Infrastructure

The HLA Run-Time Infrastructure Next Generation 1.3 (RTI-NG 1.3) from Defence Modelling Simulation Organization (DMSO) is an implementation of the High Level Architecture Specification, version 1.3. The RTI provides a collection of common services used to support the modelling and simulation applications. All of these services are accessed through a standard application programming interface (API).

3.2.4.1.3 Custom COTS CSC

The Custom COTS CSC consists of the following major components:

- Motion Platform Control Computer Software
- FREDYN
- Fast Light Tool Kit
- Fast Light User Interface Designer
- Open Audio Library

3.2.4.1.3.1 Motion Platform Control Computer Software

The Motion Platform Control Computer Software Package from Servos and Simulation, Inc. consists of the following major components:

- 3Com Ethernet Driver

- PC/TCP Kernel V4.1
- PC/TCP Kernel V4.1 Installation Software
- 6 DOF Source Code.

3.2.4.1.3.2 FREDYN

The FREDYN version 6.0 from Maritime Research Institute Netherlands (MARIN) is a computer program to simulate the motion behaviour of a steered, intact ship in moderate to extreme waves and wind. FREDYN consists of three main parts: CDAWSP, FREINP and FREDYN. Table 9 provides a summary of these three programs.

Table 9 Summary of FREDYN Programs

Program Name	Descriptions
CDAWSP	Hull Geometry Definition - reads the American Standard Commission Information Interchange (ASCII) input file containing the hull geometry data and converts the station offsets to splines.
FREINP	Generation of Time-Independent Coefficients - determines the hydrodynamics coefficients for a given ship. These coefficients are stored on a data file, which serves as input file to FREDYN.
FREDYN	Time Domain Simulation - performs the time domain simulation of a steered ship in waves. The results can be stored in a data file and printed.

The FREDYN (simulation) program, which is normally running in the IOS Workstation Computer, is used to model the CPF motion characteristics in the simulator.

3.2.4.1.3.3 Fast Light Tool Kit

The Fast Light Tool Kit (FLTK) provides the necessary GUI for controlling the simulation exercise.

3.2.4.1.3.4 Fast Light User Interface Designer

The Fast Light User Interface Designer (FLUID), a graphical editor, is used to produce FLTK source code. The FLUID editor can be used to edit and save its state in FLUID files.

3.2.4.1.3.5 Open Audio Library

The OpenAL from Loki Entertainment Software is an Application Programming Interface (API) for interactive, primarily spatialized audio.

3.2.4.2 HDLS-SMART CSCI

The HDLS-SMART CSCI consists of the following major items:

- Simulation Modelling Acquisition Rehearsal and Training (SMART) Application Software
- SMART Audio Video Data Base Software (SAVDB)
- HDLS Application Software.

3.2.4.2.1 SMART Application Software

The SMART application software is a collection of hardware drivers and software utilities commonly required by simulation applications. It consists of the following software items:

- CerealBox Driver
- Motion Platform Driver
- Tracker Driver
- Audio Driver
- Dynamics
- Performer
- Graphics User Interface
- Multithreading
- Data Tree
- Network Interface Module (NIM)
- Socket
- Debug
- FileIO

- Utilities
- Filters
- Record
- Serial Port
- IPME

3.2.4.2.1.1 CerealBox Driver

The CerealBox Driver Library is an I/O interface to the CerealBox hardware device, allowing applications to collect analogue and digital data packets over a RS-232 serial link.

3.2.4.2.1.2 Motion Platform Driver

Motion Platform Driver Library provides a driver for interfacing with six degrees of freedom motion platforms.

3.2.4.2.1.3 Tracker Driver

Tracker Driver provides a common interface for communicating with various head movement tracking devices.

3.2.4.2.1.4 Audio Driver

The Audio Driver supports sound production. The sound production component makes use of a client/server architecture. This allows the audio component to be distributed across a multi-platform network with clients running on high performance graphics workstations, while the server resides on a low cost PC (running Linux).

3.2.4.2.1.5 Dynamics

The dynamics model supports three different types of dynamics components: Helo Dynamics, Ship Dynamics, and Sea Dynamics. Each component handles a different type of movement characteristics.

The Helo Dynamics software provides the necessary interfaces to the Sea King helicopter flight dynamics model. The Ship Dynamics software provides the necessary interfaces to the Canadian Patrol Frigate (CPF) ship dynamics model. The Sea Dynamics software provides the necessary interfaces to the ocean wave model.

3.2.4.2.1.6 Performer

The Performer driver software provides the necessary interfaces to the OpenGL Performer software package. OpenGL Performer is a software package for managing and rendering real-time three-dimensional graphics.

3.2.4.2.1.7 Graphics User Interface

The graphical user interface software for SMART provides the necessary interfaces for the Fast Light Tool Kit (FLTK). The software is a collection of custom widgets and utilities that can be used to enhance the functionality of basic user interfaces.

3.2.4.2.1.8 Multithreading

The Multithreading package provides a consistent mechanism for handling multiple, concurrent tasks (processes) to ensure real time performance. It allows computationally intensive tasks to run concurrently, removing bottlenecks and allowing for the maximum use of available computer resources.

3.2.4.2.1.9 Network Interface Module

The Network Interface Module (NIM) is a software package that has been developed by DRDC Toronto as an interface to the RTI, allowing SMART applications to make use of HLA without the tedium and complexity of dealing directly with the RTI.

3.2.4.2.1.10 Socket

The Socket package provides an interface for client/server socket communication through the sending and receiving of fixed size data packets.

3.2.4.2.1.11 Data Tree

The Data Tree package provides a hierarchical data type that can be read from and written to a file. This package is used to store all the simulation configuration data.

3.2.4.2.1.12 Debug

The Debug package provides a mechanism for flagging notable events and for filtering those events based on their level of severity during development and testing.

3.2.4.2.1.13 FileIO

The FileIO package is a simple utility for reading from and writing to a file.

3.2.4.2.1.14 Utilities

The Utilities package provides general purpose software utilities and data types that are common to many applications.

3.2.4.2.1.15 Filters

The Filters package provides interfaces to a Kalman filter, which is used to smooth out the velocity and acceleration.

3.2.4.2.1.16 Record

The Record package provides interfaces for record and playback.

3.2.4.2.1.17 Serial Port

The Serial Port package provides interfaces to communicate with a serial port.

3.2.4.2.1.18 IPME

The Integrated Modeling Performance Environment (IPME) is a commercial software tool that provides an environment for modeling systems that require a measure of human performance. In the HDLS, a driver is provided that allows the simulation to connect to a helicopter auto-pilot in

IPME which may take control of the simulation helicopter. This is not available in the Operational environment at 12 Wing.

3.2.4.2.2 SMART Audio Video Data Base Software (SAVDB)

The SMART Audio Video Data Base Software Package consists of the following major components:

- Model Interface
- Ocean Model Interface
- Sky Model Interface
- CPF Model Interface
- Sea King Helicopter Model Interfaces
- DeckCrew Model Interface.

Note that the synthetic models of LSO enclosure, helicopter, and ship deck are only approximations of the actual objects.

3.2.4.2.2.1 Model Interface

The Model Interface software package provides the necessary interfaces to the simulated models, which include the ocean, sky, CPF, and Sea King helicopter models.

3.2.4.2.2.2 Ocean Model Interface

The Ocean Model Interface software package provides the necessary interfaces to the simulated ocean and wave model.

3.2.4.2.2.3 Sky Model Interface

The Sky Model Interface software package provides the necessary interfaces to the simulated sky model.

3.2.4.2.2.4 CPF Model Interface

The CPF Model Interface software package provides the necessary interfaces to the simulated CPF three-dimensional graphical model.

3.2.4.2.2.5 Sea King Helicopter Model Interface

The Sea King Helicopter Model Interfaces software package provides the necessary interfaces to the Sea King helicopter three-dimensional graphical model.

3.2.4.2.2.6 DeckCrew Model Interface

The DeckCrew Model Interfaces software package provides the necessary interfaces to manipulate the three-dimensional graphical models of human deckcrew members.

3.2.4.2.3 HDLS Application Software

The HDLS Application Software package consists of the following major components. It should be noted that this list is a conceptual grouping, strongly but not necessarily directly reflected in source directory structure. The actual source directory structure has significantly morphed since in its initial inception to its current structure. Now, packages such as Clients, Profiles, Sources, HDLS Utilities, and Views are located within RHS-Core/Streams/. Other packages such as Model, Engine, Federate, Session Manager, and Control, have some representation in RHS-Core/Kernel/.

- HDLS Graphical User Interfaces
- Federates
- Session Manager
- Sources
- Control
- Views
- EntityDatabase
- Models
- Engines
- Clients
- Profiles
- HDLS Utilities
- Mains.

3.2.4.2.3.1 HDLS Graphical User Interface

The HDLS Graphical User Interfaces software package provides the necessary mechanisms for defining the user interface to control the simulation.

3.2.4.2.3.2 Federates

The Federates software package provides the necessary interfaces to encapsulate each participant in a federate.

3.2.4.2.3.3 Session Manager

The Session Manager provides the necessary interfaces for session controls within a scenario.

3.2.4.2.3.4 Sources

The Sources software package provides the necessary interfaces to handle multiple input data streams into a federate.

3.2.4.2.3.5 Controls

The Controls software package provides the necessary interfaces to handle the manipulation data stream.

3.2.4.2.3.6 Views

The Views software package provides the necessary interfaces to handle the output streams.

3.2.4.2.3.7 Entity Database

The Entity Database (or EntityDB) software package provides the federate and all its components with full access to the contents of all entities. It is a static repository of all entities used by a federate.

3.2.4.2.3.8 Models

The Models software package provides the necessary interfaces to encapsulate the actual data within an entity.

3.2.4.2.3.9 Engines

The Engines software package provides the necessary interfaces to be used by the Control to manipulate the data within an entity.

3.2.4.2.3.10 Clients

The Clients software package provides the necessary interfaces for translating input from the various sources into a form the entity can understand, and then storing that information in the model.

3.2.4.2.3.11 Profiles

The Profiles software package provides the necessary interfaces for translating the contents of an entity by first extracting data from the model, and then converting data into a format understood by the view.

3.2.4.2.3.12 Mains

The Mains software package contains the top-level main routines for IOS Control and Pilot Control.

3.2.5 Software Development Tools

Some of the non-deliverable software development tools include:

- MATRIXx
- MultiGen.

3.2.5.1 MATRIXx

The MATRIXx software tool from MathWorks is a family of products for real-time embedded control system applications. Table 10 provides a summary of five major components.

Table 10 MATRIXx Major Components

Component Name	Description
Xmath	System analysis and visualization environment. It contains over 700 predefined functions and commands, interactive colour graphics and a programmable graphical user interface.
SystemBuild	A graphical programming environment that uses a block diagramming paradigm with hierarchical structuring for modelling and simulation of linear and non-linear dynamics systems. It allows interactive model verification, testing and modification.
AutoCode	A code generation tool for processing SystemBuild model files to produce C or Ada code. The Autocode output can be compiled to produce the real-time flight simulation.
Documentlt	A documentation tool to create documentation from SystemBuild model files
Realsim	A simulation tool for performing real-time simulations of feedback control system models developed in SystemBuild

NOTE

MATRIXx uses a co-ordinate system called Earth Fixed Frame. Earth Fixed Frame assumes that the earth's horizon is flat. All horizontal, vertical and rotational data for a body in space, such as a synthetic helicopter, is based on its position from the Earth's Fixed Frame. The Earth Fixed Frame uses the standard scientific nomenclature of "X" for longitudinal axis, "Y" for the Lateral Axis, and "Z" for the vertical axis.

NOTE

The MATRIXx aerodynamic software module uses, for the synthetic helicopter, a single C of G position of 2.38 metres below the centre of the rotating rotor disc (on the longitudinal centre line of the airframe) or 2.34 metres above the extended wheels. Either of these two values equate to a single Z position within MATRIXx. The centre of the synthetic rotor disc is a point in space within MATRXx and must not be confused with the centre of the rotor hub of a real helicopter rotor system. Therefore, the calculations for C of G for a real helicopter airframe (that are reference to the airframe being level upon the earth's surface) do not equate to the C of G calculations made within MATRIXx.

NOTE

The C of G properties of the helicopter embodied within MATRIXx do change when a force is applied to the synthetic helicopter with a haul down cable.

NOTE

The value of torque displayed on the cockpit torque-meter is an approximation of a typical torque value for a CH124 operating at 16,600 lbs.

NOTE

The MATRIXx aerodynamic software module employs a value of 16,600 lbs for the flying weight of the synthetic helicopter. This value was selected based on a typical post sortie CH124 recovery while operating at the greatest fuel load that would facilitate using the haul down cable equipment at the maximum possible tension of 4,000 lb.

NOTE

The fuel level displayed on the cockpit's synthetic fuel gauges (4,000 lbs) plus a typical Basic Empty Weight (15,500 lbs) of a real CH124 is not consistent with the flying weight (16,600 lbs) for the virtual CH124. The synthetic CH124 operates in accordance with the parameters of the MATRIXx aerodynamic software module.

3.2.5.2 MultiGen Creator

The MultiGen Creator from MultiGen Paradigm is a software toolset for creating highly optimized, high fidelity real-time 3D database for use in visual simulation, interactive games, urban simulation, and other applications.

4 Simulator Operating Procedures

4.1 Simulator Set-Up Instructions

4.1.1 Simulator Hardware Set-Up Instructions

4.1.1.1 Simulator Hardware Power-On Instructions

The procedures used to power on the simulator hardware are maintained in the document named Helicopter Maritime Environment Trainer (HelMET) Start-Up, Virtual Lesson Plan (VLP) Editor, and Shutdown Manual (filename HelMET Startup 4.x_Rev_002) produced by the Synthetic Environment Support Group at DRDC Toronto and Currently maintained by 12 Wing in Shearwater.. The power-on section includes steps 1 through 108.

WARNING

At this point, the Motion Platform Subsystem is operational and all control inputs from the Motion Platform Control Computer will cause the Motion Platform Leg Assemblies to move.

4.1.1.2 Simulator Hardware Power-Off Instructions

The procedures used to power off the simulator hardware are maintained in the document named Helicopter Maritime Environment Trainer (HelMET) Start-Up, Virtual Lesson Plan (VLP) Editor, and Shutdown Manual (filename HelMET Startup 4.x_Rev_002) produced by the Synthetic Environment Support Group at DRDC Toronto. The power-off section includes steps 142 through 206:

4.1.2 Simulator Software Preparation

The software preparation is applicable to the following computers:

- Simulation Computer
- IOS Computer
- LSO Computer
- Audio Subsystem Computer 1

- Audio Subsystem Computer 2
- Motion Platform Control Computer.

4.1.2.1 Simulation Computer Software Preparation

4.1.2.1.1 Simulation Computer Software Packages

The following software packages are required to run the Simulation Computer software:

- RedHawk Linux 4.2.1
- HelMET Support Software CSCI - includes OpenGL Performer for Linux 3.1.1
- HelMET Operational Software CSCI - Linux.

4.1.2.1.2 Storage Media

The Simulation Computer software packages are provided on CD-ROM disk.

4.1.2.1.3 Software Loading Instructions

Normally, the Simulation Computer software packages are already installed in the system. Information on loading software on the Simulation Computer is described in the HelMET Version Description Document [Reference i].

4.1.2.1.4 Software Initialization Instructions

It can be said that there are actually three fundamental modes of operation of the HelMET, VLP edition, VLP operation, and manual operation. The document named Helicopter Maritime Environment Trainer (HelMET) Start-Up, Virtual Lesson Plan (VLP) Editor, and Shutdown Manual (filename HelMET Startup 4.x_Rev_002) produced by the Synthetic Environment Support Group at DRDC Toronto describes the VLP edition mode in steps 109 through 141.

The following procedures are used to initialise the Simulation Computer software to support VLP and manual operation modes:

- Assume that the Motion Platform Control Computer software has been loaded.

- The Simulation Computer software is started by double-clicking on the HelMET icon on the IOS display monitor located at the Instructor Operator Station.
- The HelMET Training Window (see Figure 4) is displayed on the IOS display monitor after a few seconds.

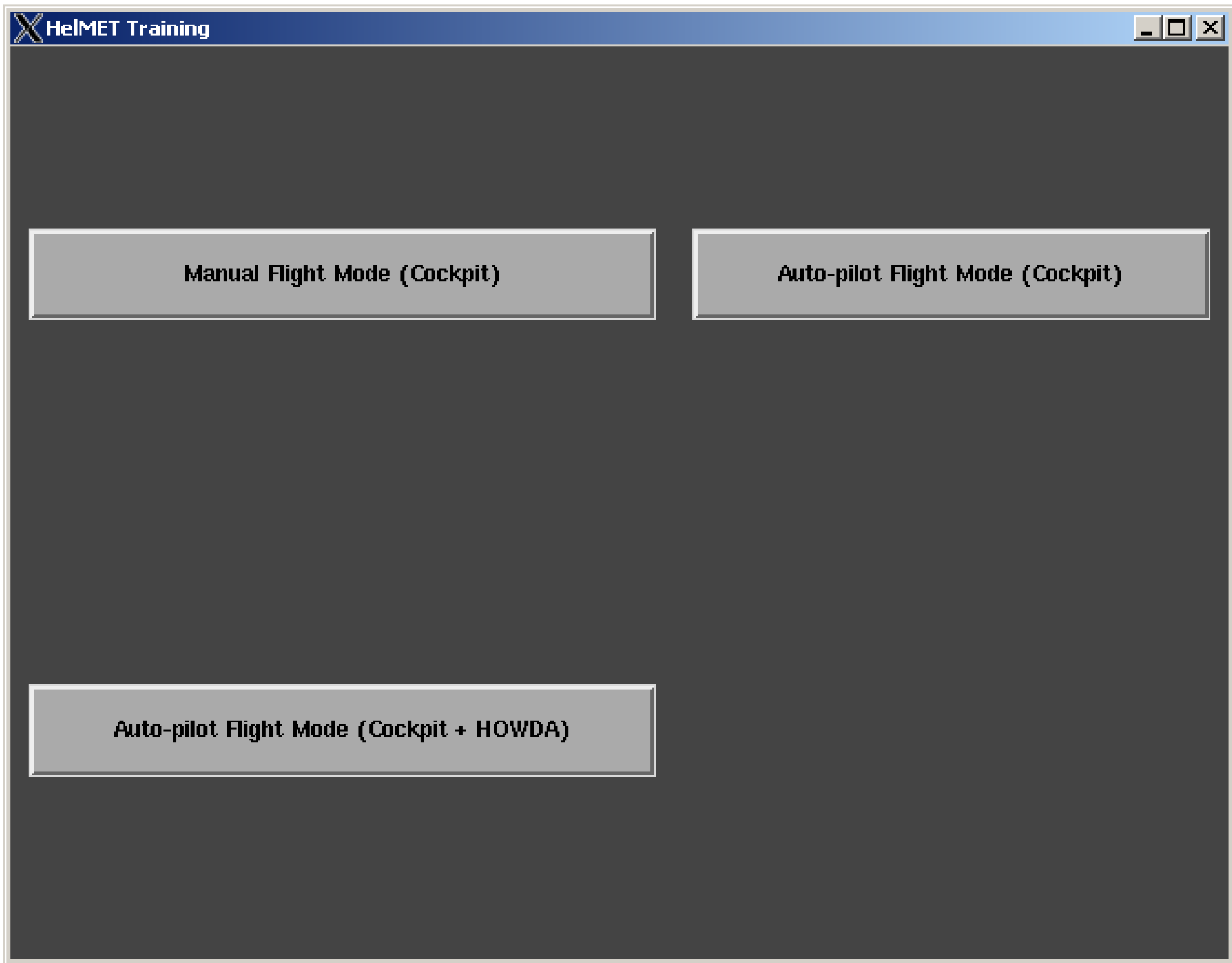


Figure 4 HelMET Training Window

For VLP Operation select either Auto-pilot Flight Mode (Cockpit) or Auto-pilot flight mode (Cockpit + HOWDA) to include the LSO. Please refer to the Helmet 4 4 IOS User's Guide _Rev 011.

Selecting Manual Flight Mode brings up a further HelMET Training window (see Figure 5) which allows the operator to specify the positions to be included in the exercise.

Figure 5 Manual Flight Mode position Selection Window

The IOS operator selects a positions button and at this point the Simulation software is operational.

4.1.2.2 IOS Computer Software Preparation

4.1.2.2.1 IOS Computer Software Packages

The following software packages are required to run the IOS Computer software:

- Red Hat Linux 8.0
- HelMET Support Software CSCI - Linux.
- HelMET Operational Software CSCI - Linux.

4.1.2.2.2 Storage Media

The IOS Computer software packages are provided on CD_ROM Disks.

4.1.2.2.3 Software Loading Instructions

Normally, the IOS Computer software packages are already installed in the system. Information on loading software on the IOS Computer is described in the HelMET Version Description Document [Reference i].

4.1.2.2.4 Software Initialization Instructions

See instructions in Section 4.1.2.1.4 for software Initialization. All VLP Operations Modes and Manual Mode selections include the IOS.

4.1.2.3 LSO Computer Software Preparation

4.1.2.3.1 LSO Computer Software Packages

The following software packages are required to run the IOS Computer software:

- Red Hat Linux 8.0
- HelMET Support Software CSCI - Linux.
- HelMET Operational Software CSCI - Linux.

4.1.2.3.2 Storage Media

The LSO Computer software packages are provided on CD_ROM Disks.

4.1.2.3.3 Software Loading Instructions

Normally, the LSO Computer software packages are already installed in the system. Information on loading software on the LSO Computer is described in the HelMET Version Description Document [Reference i].

4.1.2.3.4 Software Initialization Instructions

See instructions in Section 4.1.2.1.4 for software Initialization. Selection of the VLP Operations Modes Auto-pilot Flight Mode (Cockpit and HOWDA) or the Manual Flight Modes that specify LSO will result in starting the LSO Software.

4.1.2.4 Audio Subsystem Computer Software Preparation

4.1.2.4.1 Audio Subsystem Computer Software Packages

The following software packages are required to run the Audio Subsystem Computer software:

- Red Hat Linux 8.0
- HelMET Support Software CSCI - Linux.
- HelMET Operational Software CSCI - Linux.

4.1.2.4.2 Storage Media

The Audio Subsystem Computer software packages are provided on CD_ROM Disks.

4.1.2.4.3 Software Loading Instructions

Normally, the Audio Subsystem Computer software packages are already installed in the two computer systems. Information on loading software on the Audio Subsystem Computer is described in the HelMET Version Description Document [Reference i].

4.1.2.4.4 Software Initialization Instructions

The following procedures are used to initialize the software for each Audio Subsystem Computer:

- Assume that the Motion Platform Control Computer software, Simulation Computer software, and IOS Computer software have been loaded.
- The Audio Subsystem Computer is logged in as a HelMET user.

The Audio Subsystem Computer software will be automatically activated as required by HelMET.

4.1.2.5 Motion Platform Control Computer Software Preparation

4.1.2.5.1 Motion Platform Control Computer Software Packages

The following software packages are required to run the Motion Platform Control Computer software:

- Microsoft MS-DOS Version 6.22
- An Ethernet packet driver for the specified Ethernet card
- FTP Software PC/TCP for DOS software
- Servos and Simulation Inc. 6-DOF software.

4.1.2.5.2 Storage Media

The Motion Platform Control Computer software packages are provided on 3.25 inch diskettes.

4.1.2.5.3 Motion Platform Control Computer Software Initialization Instructions

The following procedures are used to initialize the Motion Platform Control Computer software:

- Turn on the Motion Platform Control Computer, including the display monitor.

CAUTION

After the computer starts its booting process, pressing any key will exit to a DOS command prompt. This is not the normal procedure.

- If no key is pressed, the Opening Display window is displayed.
- At this point, the Simulation Computer and Motion Platform Control Computer can exchange commands. The Running Display window is displayed.
- From this point, status reports will be displayed in the status report box of the Running Display window.

4.1.3 Other Set-up Preparations

4.1.3.1 Simulator Equipment Pre-test Preparations

The following procedures are used by the Instructor to prepare the simulator hardware for simulation testing:

- Prepare the Simulation Computer Subsystem
- Prepare the IOS Computer Subsystem
- Prepare the LSO Computer Subsystem
- Prepare the Audio Communication Subsystem
- Prepare the Sound and Vibration Subsystems
- Prepare the Video Distribution Subsystem
- Prepare the Flight Control Component Subsystem
- Prepare the Visual Subsystem
- Prepare the Motion Platform Subsystem.

4.1.3.2 Pilot Pre-test Preparations

The following procedures are used by the Instructor to prepare the pilot for simulation testing:

- Assist the pilot to be seated from the right-hand side of the motion platform.
- Explain the emergency momentarily motion stopping switch to the pilot (refer to the Warning page of this document).
- Assist the pilot to strap on the safety harness.
- Assist the pilot to adjust the seat to a comfortable position.
- Explain the HMD adjustment procedures to the pilot.
- Explain the HMD audio communication procedures to the pilot.

4.2 Simulator Normal Operating Procedures

The normal operating procedures are maintained by 12 Wing Shearwater. The conversion of the simulator default focus from Manual Flight Mode to using Virtual Lesson Plans (VLP) has significantly changed the normal use of the simulator. However, all the manual control is still available in Manual Flight Mode for demonstration of the fully interactive simulator. It is described below in the Simulator Normal Manual Operating Procedures. The user is invited to consult the HelMET 4.4 IOS User's Guide Rev. 11 for the normal operating procedures.

4.3 Simulator Normal Manual Operating Procedures

This section details the now rarely used normal manual operating procedures of the HelMET simulation. Originally described in 2002, many features remain unchanged. However, the addition of major simulation features such as the independent LSO station and visible deck crew required some updating to the procedures. Those known changes are described where they occur for each of the provided original GUI interfaces below. The changes are not so significant so as to be obscure to a member of the development team. The functional change can be easily understood for virtually any, if not all differences.

The following normal operating procedures are used to run the simulator at the Instructor Operator Station:

- Double-click the HelMET icon on the IOS display monitor to bring up the HelMET Training Window (see Figure 4).
- Click the Manual Flight Mode (Cockpit) button to bring up the further HelMET Training window (see Figure 5) to select the positions to be included in the exercise.

- Selecting the button for the desired player set will bring up the HelMET Pilot Control Main Window, the HelMET IOS Main Window and the LSO Main Window (if requested). Note that it may take a few seconds for the HelMET windows to display.

The simulator is normally shut down by running through the GUI. However, in case the normal shutdown cannot be performed, the operator is provided with the option of shutting down the simulator by double-clicking the Kill HelMET and the Kill Helo icons on the IOS display monitor. This will kill all processes that are related to the simulator and can be used when the normal shut down procedure fails or is unavailable.

4.3.1 HelMET IOS Graphic User Interface

The HelMET IOS Graphic User Interface (GUI) main window, shown in Figure 6 is displayed after the HelMET IOS federate is successfully launched. The HelMET IOS GUI can be divided into the following parts for discussion purposes:

- HelMET IOS Main Window Naming Area
- HelMET IOS Main Window Menu Bar Area
- HelMET IOS Main Window Session Control Area
- HelMET IOS Start Session Window
- HelMET IOS Instructor Display View Area
- HelMET IOS Integrated Control Panel Area
- HelMET IOS LSO Control Panel Area
- HelMET IOS FLYCO Control Panel Area
- HelMET IOS NFC Control Panel Area
- HelMET IOS Bridge Control Panel Area
- HelMET IOS Helicopter Situation Display Area
- HelMET IOS Ship Situation Display Area
- HelMET IOS General Situation Awareness Display Area
- HelMET IOS Replay Window Area
- HelMET IOS Miscellaneous Windows.

4.3.1.1 HelMET IOS Main Window Naming Area

The HelMET IOS Window Naming Area is located at the top of the main window, shown in Figure 6. It provides the following components:

- Window Menu Button
- Title Bar
- Minimize Button.

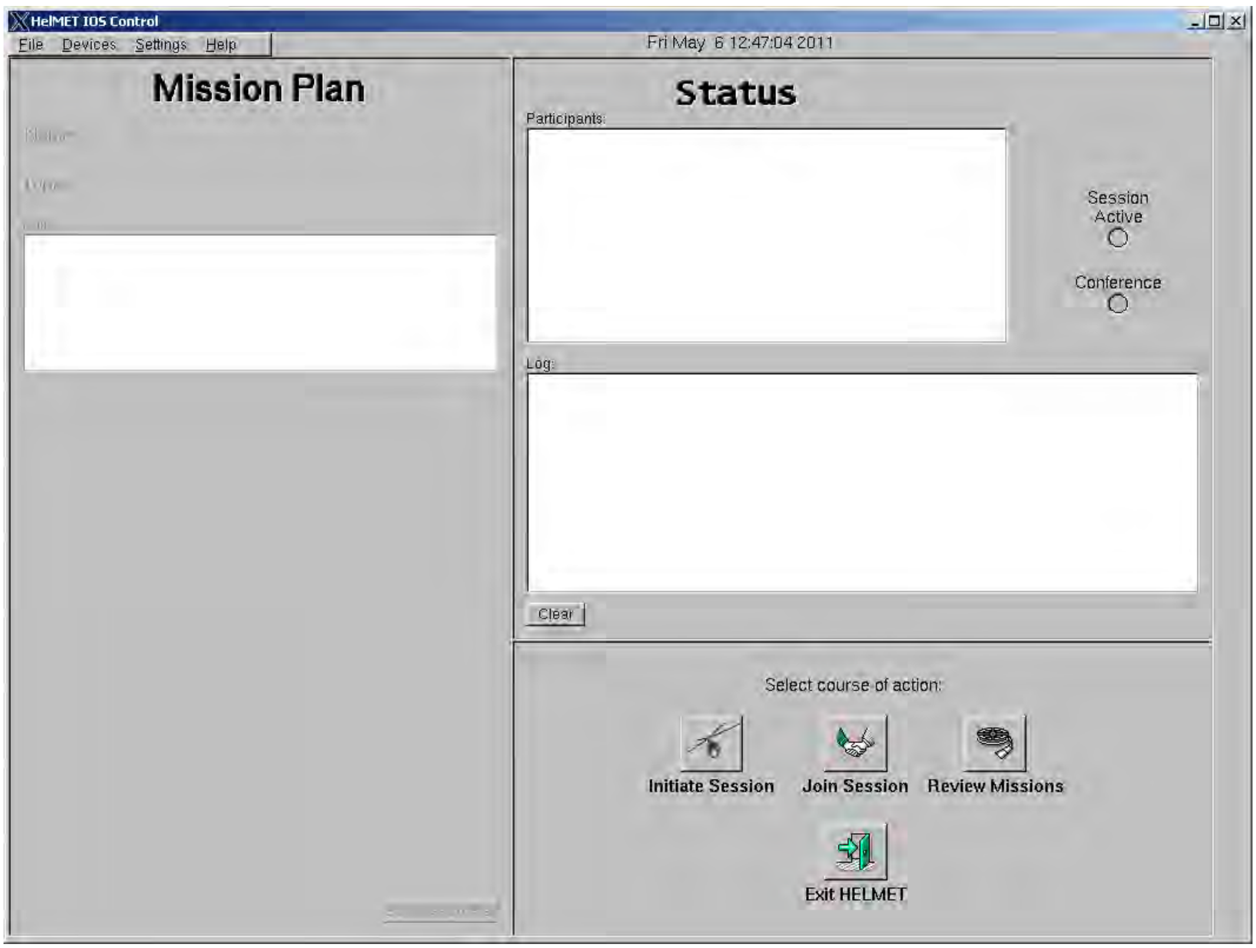


Figure 6 HelMET IOS Main Window at Initialization

4.3.1.1.1 Window Menu Button

The Window Menu button is used to display the list of window actions. The Window Menu provides the following entries as described in Table 11.

Table 11 Entries of Window Menu Button

Entry	Definition
Restore	Restore a minimized or maximized window to the previous size and location of the window.
Move	Move a window around the screen.
Size	Change the height and width of the window in the direction indicated by the pointer.
Minimize	Change a window into an icon.
Maximize	Enlarge a window to its maximum size.
Close	Close a window and removes it from the screen. This button will not have any effect.

4.3.1.1.2 Title Bar

The Title Bar area contains a short string title (e.g. HelMET IOS Control) that labels the contents of the window.

4.3.1.1.3 Minimize Button

The Minimize button provides the instructor a shortcut to the Minimize entry in the Window Menu.

4.3.1.1.4 Close Button

The Close button has been disabled for the HelMET applications.

4.3.1.2 HelMET IOS Main Window Menu Bar Area

The HelMET IOS Main Window Menu Bar area is located below the HelMET IOS Window Naming Area. It provides the following four window menus for selection:

- File
- Devices
- Settings
- Help.

4.3.1.2.1 File Window Menu

The File Window menu is used to display the list of window actions for the file operations. The Window Menu provides the following entries as described in Table 12.

Table 12 Selections of File Window Menu

Item	Definition
New Mission Plan	Select to create a new mission plan. The mission plan can be either a Deck Landing Procedure or a Helicopter Air Manoeuvre type.
Open	Select to open a window for selecting an existing mission plan.
Edit	Select to edit a current open mission plan.
Save As	Select to save the currently open mission plan with a new name.
Close	Select to close the currently open mission plan.
Save Mission(s)	Select to save a training session log.
Clear	Select to clear the training session log.
Exit	Select to exit from program execution.

4.3.1.2.1.1 Create Mission Window

The Create Mission Window, as shown in Figure 7, allows the instructor to select the type of mission for creation. The valid mission types are Helicopter Air Maneuvers (HAM) or Deck Landing Procedures (DLP). The Create Mission Window provides the following selections as described in Table 13.

Figure 7 Create Mission Window

Table 13 Selections of Create Mission Window

Selection	Definition
Mission Type Options	Select a mission type option. The valid options are Helicopter Air Maneuvers or Deck Landing Procedures.
Next Button	Open a mission plan window based on the selected mission type.
Cancel Button	Cancel and exit from the Create Mission window.

4.3.1.2.1.2 Deck Landing Procedures Mission Plan Window

The Deck Landing Procedures Mission Plan Window, shown in Figure 8, allows the instructor to define data for a Deck Landing Procedures mission plan. The DLP mission type is used for training the pilot to land the helicopter on the deck. There are three supported scenarios, Daytime

Freedeck Launch scenario, Nighttime Freedeck Recovery scenario, and Daytime Hauldown Recovery scenario.

The DLP Mission Plan Window can be divided into the following sub-areas:

- Environmental Conditions – contain type of Lighting, Helo Position, Visibility, Temperature, Altimeter, Fuel and Time.
- Deck Motion Conditions – contain type of Deck Motion.
- Ship Conditions – contain Ship Heading and Ship Speed.
- Wind conditions – contain Wind Heading and Wind Speed.
- Primary Wave Conditions – contain Primary Wave Heading, Primary Wave Height, and Primary Wave Period.
- Interference (or Secondary) Wave Conditions – contain Interference Wave Heading, Interference Wave Height, and Interference Wave Period.

Detailed descriptions of the DLP Window selections are provided in Table 14.

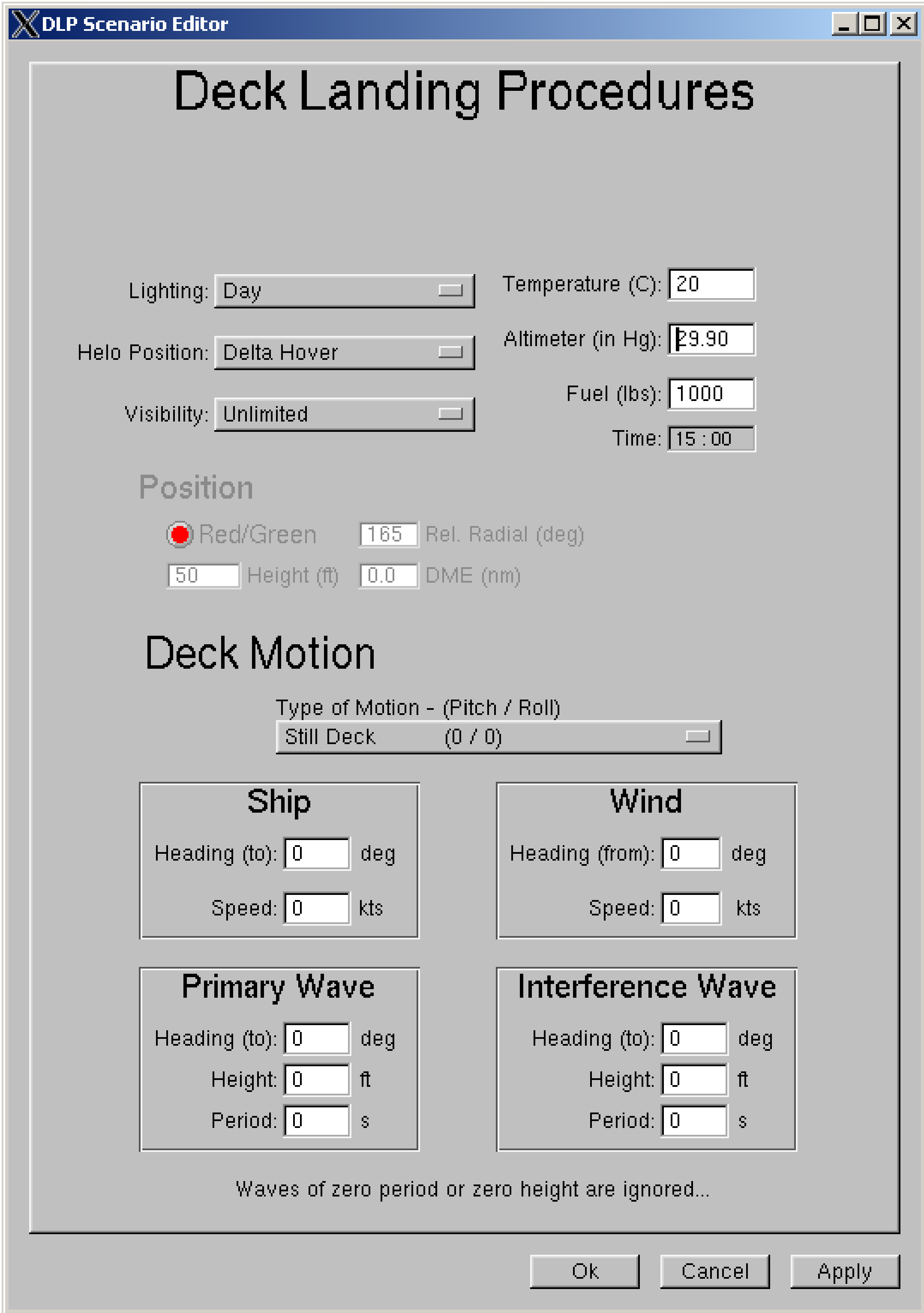


Figure 8 Deck Landing Procedures Window

Table 14 Selections of Deck Landing Procedures Data

Entry	Definition
Environmental Conditions	
Lighting	This field is used to select the lighting condition of the environment. The Valid options are Day, Dusk, Full Moon and No Moon. Lighting conditions during the mission are taken entirely from the “Lighting” setting.
Helo Position	This field is used to select the helicopter start position relative to the ship. The valid options are On Deck, Low Hover, High Hover, and Delta Hover, Three Miles Back and Custom.
Position	This area displays the position selected using the Helo Position Tool or allows the Position to be set as Red/Green, Radial Angle, Height and DME Distance if Custom is set on the Helo Position tool.
Visibility	This field is used to define the visibility condition of the environment. The valid options are Unlimited, Two Nautical Miles, One Nautical Mile, Half Nautical Miles, and Zero Zero.
Temperature	This field is used to select the current temperature of the environment. Valid inputs range from 0.0 to 100 ºC. Note that the temperature setting has no effect on the simulation.
Altimeter	This field is used to define the atmospheric condition of the environment. Valid inputs range from 0 to 100.0 in Hg. Note that the altimeter setting has no effect on the simulation.
Fuel	This field is used to define the amount of Fuel carried by the Helicopter given in lbs.
Time	This field displays the time as set by the Lighting Field tool.
Deck Motion Conditions	
Deck Motion	This field is used to select the preset deck motion options or

Entry	Definition
	Custom. The preset deck motion options are: Still Deck (0/0), Low Pitch and Roll (1/3), Med Pitch Only (2/0), Med Roll Only (0/6), Med Pitch and Roll (2/6), High Pitch Only (3/0), High Roll Only (0/10) High Pitch and Roll (3/10). The presets update the values in the Primary Wave field.
Ship Conditions	
Ship Heading	This field is used to define the ship heading angle in degrees. Valid inputs range from 0 to 359 degrees. The Ship Heading is the direction that the ship is sailing towards.
Ship Speed	This field is used to define the ship speed in knots. Valid inputs range from 0 to 40 knots.
Wind Conditions	
Wind Heading	This field is used to define the wind heading angle in degrees. Valid inputs range from 0 to 359 degrees. The Wind Heading is the direction from which the wind is blowing.
Wind Speed	This field is used to define the wind speed in knots. Valid inputs range from 0 to 71 knots.
Primary Wave Conditions - Displays the values set by the preset Deck Motion conditions or allows entry of Primary Wave Conditions which will cause the Deck Motion tool to change to Custom.	
Primary Wave Heading	This field is used to define the primary wave heading angle in

Entry	Definition
	degrees. Valid inputs range from 0 to 359 degrees. The Primary Wave Heading is the direction from which the wave is moving towards.
Primary Wave Period	This field is used to define the primary wave period in seconds. Valid inputs range from 0 to 80 seconds.
Primary Wave Height	This field is used to define the primary wave height in feet. Valid inputs range from 0 to 35 feet.
Interference Wave Conditions	
Interference Wave Heading	This field is used to define the interference wave heading angle in degrees. Valid inputs range from 0 to 359 degrees. The Interference Wave Heading is the direction from which the wave is moving towards.
Interference Wave Period	This field is used to define the interference wave period in seconds. Valid inputs range from 0 to 80 seconds.
Interference Wave Height	This field is used to define the interference wave height in feet. Valid inputs range from 0 to 35 feet.
Window Action Controls	
OK Button	This button is used to accept the instructor inputs with validation and close the Deck Landing Procedures window.
Cancel Button	This button is used to ignore the instructor inputs and close the Deck Landing Procedures window.
Apply Button	This button is used to accept the instructor inputs with validation.

NOTE

Changes in parameters of Temperature and Altimeter do not affect the aerodynamic properties and ambient lighting conditions of the simulated training session

NOTE

Although Secondary Wave data can be entered as an environmental factor and will affect the ship's motion, the influence of the secondary waves has not been validated. Only the motion of the Primary Waves has been validated in the "FREDYN" sea state module.

NOTE

The image of the surface of the virtual sea will not change in appearance with the addition or elimination of an Interference Wave.

The wind speed, wave period, and wave height are related to sea state. Their relationships are defined in Table 15. A checking mechanism is implemented in the software to ensure that the wind speed, wave period and wave height are entered in accordance to the ranges set within the table.

Table 15 Wind and Sea Scale for Fully Arisen Sea

Sea State	Min Wind Speed (knots)	Max Wind Speed (knots)	Min Wave Period (seconds)	Max Wave Period (seconds)	Wave Height (feet)
0	-	-	-	-	0
0	1	3	0	1.2	0.05
1	4	6	0.4	2.8	0.18
1	7	10	0.8	5.0	0.6
2	7	10	1.0	6.0	0.88
2	11	16	1.0	7.0	1.4
3	11	16	1.4	7.6	1.8
3	11	16	1.5	7.8	2.0

Sea State	Min Wind Speed (knots)	Max Wind Speed (knots)	Min Wave Period (seconds)	Max Wave Period (seconds)	Wave Height (feet)
3	11	16	2.0	8.8	2.9
4	17	21	2.5	10.0	3.8
4	17	21	2.8	10.6	4.3
5	17	21	3.0	11.0	5.0
5	22	27	3.4	12.2	6.4
5	22	27	3.7	13.5	7.9
6	22	27	3.8	13.6	8.2
6	22	27	4.0	14.5	9.6
6	28	33	4.5	15.5	11
6	28	33	4.7	16.7	14
7	28	33	4.8	17.0	14
7	28	33	5.0	17.0	16
7	34	40	5.5	18.5	19
7	34	40	5.8	19.7	21
7	34	40	6.0	20.5	23
8	34	40	6.2	20.8	25
8	34	40	6.5	21.8	28

Sea State	Min Wind Speed (knots)	Max Wind Speed (knots)	Min Wave Period (seconds)	Max Wave Period (seconds)	Wave Height (feet)
8	41	47	7.0	23.0	31
8	41	47	7.0	24.2	36
9	41	47	7.0	25.0	40
9	48	55	7.5	26.0	44
9	48	55	7.5	27.0	49
9	48	55	8.0	28.2	52
9	48	55	8.0	28.5	54
9	48	55	8.0	29.5	59
9	56	63	8.5	31.0	64
9	56	63	10.0	32.0	73
9	64	71	10.0	35.0	80

4.3.1.2.1.3 Helicopter Air Maneuvers Mission Plan Window

The Helicopter Air Maneuvers Mission Plan Window, as shown in Figure 9, allows the instructor to define data for a Helicopter Air Maneuvers mission plan. The HAM mission type is used for training the pilot on helicopter air Maneuvers using ADS33 visual database as a training guide.

The HAM Mission Plan Window can be divided into the following sub-areas:

- Environmental Conditions – contain type of Lighting, Visibility, Time, Temperature and Altimeter
- Helicopter Condition – contains Initial Height

- Wind Conditions – contain Wind Heading and Wind Speed

Detailed descriptions of the HAM selections are provided in Table 16.

Figure 9 Helicopter Air Maneuvers Window

Table 16 Selections of Helicopter Air Maneuvers Data

Entry	Definition
Environmental Conditions	
Lighting	This field is used to set the lighting condition of the environment. The valid options are Day, Dusk, Full Moon, and No Moon. Lighting

Entry	Definition
	conditions during the mission are taken entirely from the “Lighting” setting.
Visibility	This field is used to define the visibility condition of the environment. The valid options are Unlimited, Two Nautical Miles, One Nautical Mile, Half Nautical Miles, and Zero Zero.
Time	These two fields are used to enter the mission time in hours and minutes. The valid hour inputs range from 0 to 23 hours. The valid minute inputs range from 0 to 59 minutes. Note that the time setting has no effect on the simulation.
Temperature	This field is used to define the current temperature of the environment. Valid inputs range from 0.0 to 100 ºC. Note that the temperature setting has no effect on the simulation.
Altimeter	This field is used to define the atmospheric condition of the environment. Valid inputs range from 0 to 100.0 in Hg. Note that the altimeter setting has no effect on the simulation.
Helicopter Conditions	
Initial Height	This field is used to define the initial helicopter height from the ground. The valid height inputs range from 0.0 to 200 ft.
Initial Position	This field is used to define the initial helicopter position relative to a 0, 0 default position in Meters specified as Fore/AFT and Left/Right.
Wind Conditions	
Wind Heading	This field is used to define the angle of wind

Entry	Definition
	heading in degrees. Valid inputs range from 0 to 359 degrees. The Wind Heading is the direction from which the wind is blowing.
Wind Speed	This field is used to define the wind speed in knots. Valid inputs range from 0 to 71 knots.
Window Action	Controls
OK Button	This button is used to accept the instructor inputs with validation and close the Helicopter Air Maneuvers window.
Cancel Button	This button is used to ignore the instructor inputs and close the Helicopter Air Maneuvers window.
Apply Button	This button is used to accept the instructor inputs with validation.

4.3.1.2.2 Devices Window Menu

The Devices Window menu is used to display the list of window actions for the setting ASTI and control of the IOS CerealBox device. The Window Menu provides the following entries as described in Table 17.

Table 17 Entries of Devices Window Menu

Entry	Definition
ASTI	This selection is not valid for the current installation. It is intended for possible control of an Advances Simulation Technologies Inc. Digital Audio Communications system.

Entry	Definition
Cereal Box	This Selection brings up a Cereal Box Device panel which allows the activation of the Cereal Box and the setting of communications parameters.

4.3.1.2.2.1 Cereal Box Device Window

The Cereal Box Device window, shown in Figure 10, allows the instructor to set and control the CerealBox device. The window provides the selections as described in Table 18.

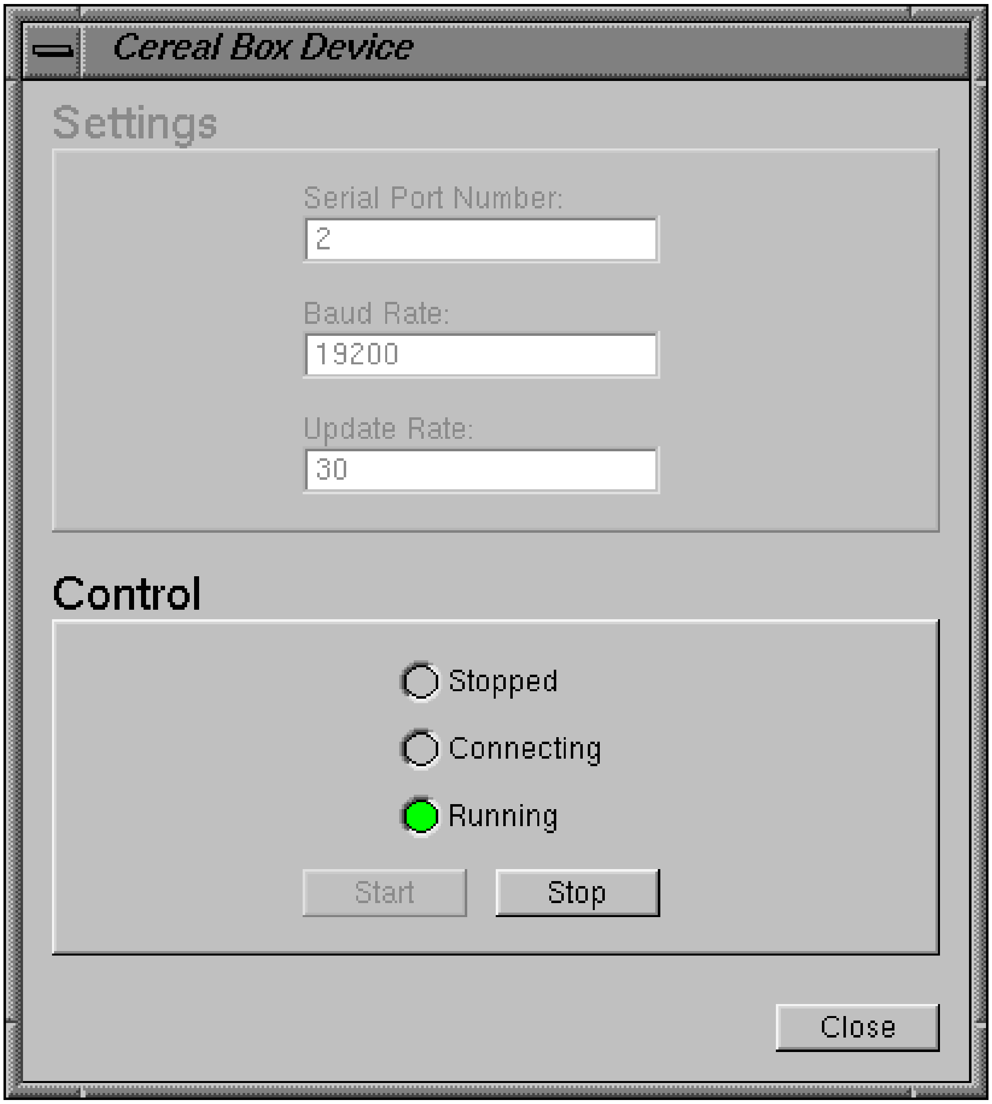


Figure 10 Cereal Box Device Window

Table 18 Cereal Box Device Functions

Entry	Definition

Entry	Definition
Settings	
Serial Port Number	Used to enter and display the PC host port number
Baud Rate	Used to enter and display the PC host serial port speed value.
Update Rate	Used to enter the update rate of the CerealBox device in Hz.
Control	
Stopped	Used to indicate that the CerealBox device process has stopped running.
Connecting	Used to indicate that the CerealBox device process is connecting to the server computer.
Running	Used to indicate that the CerealBox device process is running.
Start Button	Used to start the CerealBox device process.
Stop Button	Used to stop the CerealBox device process.
Window Action Control	
Close Button	Used to close the CerealBox device window.

4.3.1.2.3 Settings Window Menu

The Settings Window menu is used to display the list of window actions for the video settings. The Window Menu provides the following entries as described in Table 19.

Table 19 Entries of Settings Window Menu

Entry	Definition
Video Settings	This selection allows the instructor to set and control the video.

4.3.1.2.3.1 Video Settings Window

The Video Settings window, as shown in Figure 11, allows the instructor to set and control the video settings for eye viewpoint, field of view, stereoscopic settings, statistics and rendering for wireframes and textures. The Video Setting Window is available on both HelMET IOS and HelMET Pilot Control.

- The Video Setting Window can be divided into the following sub-areas:
- Eye Point Setting Selections – contain participant's eye point setting
- Eye Point Offset – contains X, Y, Z, H, P, R eye point offsets
- Statistics – contains selection of data type for statistics
- Rendering – contains selections of rendering type
- Field of View (FOV) - contains selections of FOV
- Stereo – contains entries of Stereoscopic IPD and Stereoscopic Convergence Angle
- Video Output – contains selections of video output

Detailed descriptions of the Video Setting Window selections are provided in Table 20.

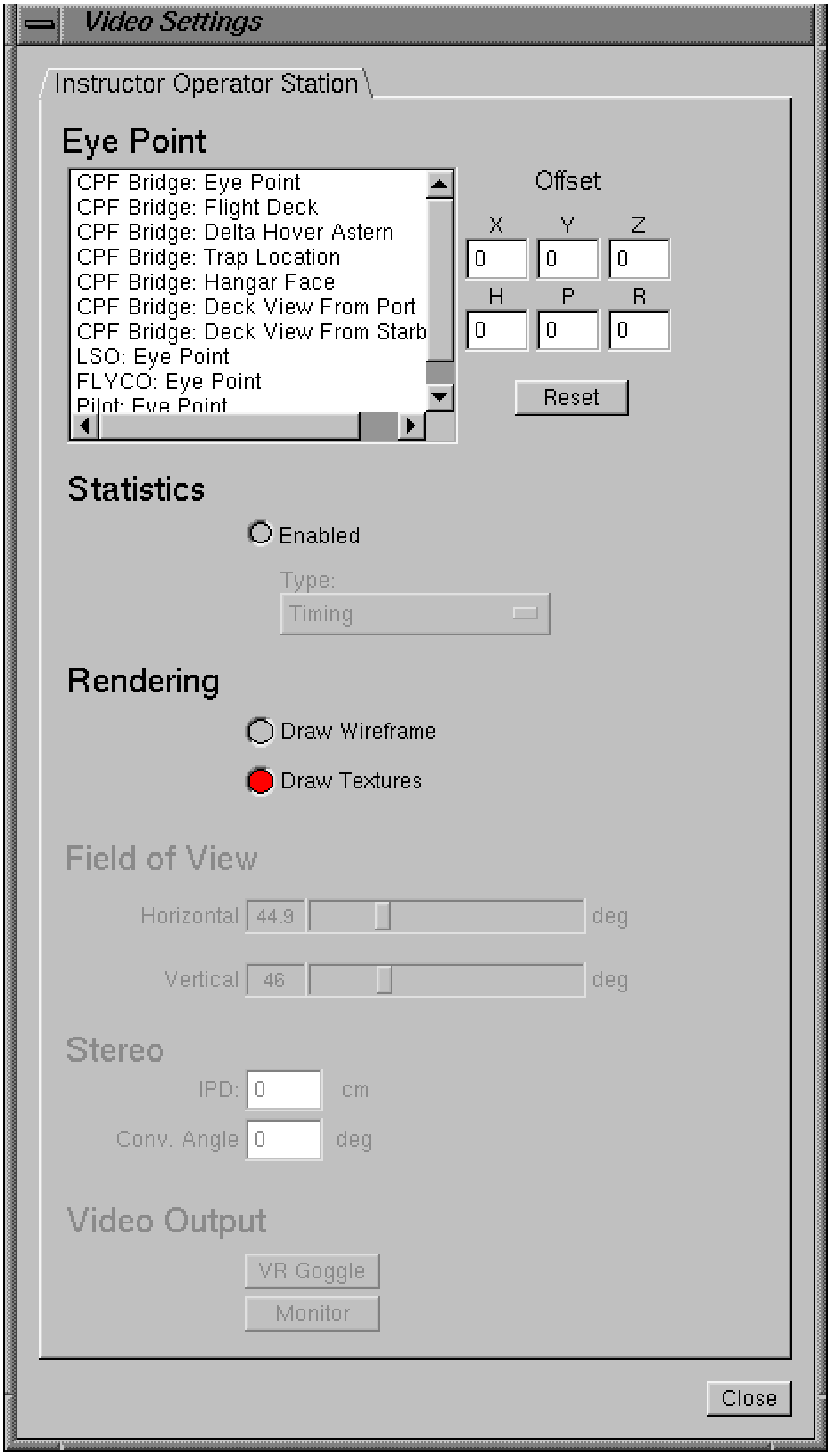


Figure 11 Video Settings Window

Table 20 Selections of Video Settings Window

Entry	Definition
Eye Point Setting Selections	
Eye Point	This field is used to select the pilot's eye point setting. This is not particularly useful on the IOS. The IOS has it's own method for changing viewpoints.
Eye Point Offset	
X	This field is used to enter the eye point offset in the x direction. This field does not affect the eye point when using a head tracking system.
Y	This field is used to enter the eye point offset in the y direction. This field does not affect the eye point when using a head tracking system.
Z	This field is used to enter the eye point offset in the z direction. This field does not affect the eye point when using a head tracking system.
H	This field is used to enter the eye point offset in the Yaw direction. This field does not affect the eye point when using a head tracking system.
P	This field is used to enter the eye point offset in the Pitch direction. This field does not affect the eye point when using a head tracking system.
R	This field is used to enter the eye point offset in the Roll direction. This field does not affect the eye point when using a head tracking system.
Reset	This field is used to set the eye point offset to zero.
Statistics	

Entry	Definition
Enabled	This option enables the system to collect statistics for data analysis.
Type	This selection enables the system to collect statistics for a selected data type.
Rendering	
Draw Wireframe	This option enables the system to generate wireframes for the video generation. The Draw Wireframe and Draw Textures options are mutually exclusive.
Draw Textures	This option enables the system to generate textures for the video generation. The Draw Wireframe and Draw Textures options are mutually exclusive.
Field of View	
Horizontal	This field is used to set the angle value in degrees for the field of view angle in the horizontal direction. This field is not available on the HelMET IOS window.
Vertical	This field is used to set the angle value in degrees for the field of view angle in the vertical direction. This field is not available on the HelMET IOS window.
Stereo	
IPD	This field is used to enter the distance between two eyes in cm for the stereoscopic offset. This field is not available on the HelMET IOS window.
Conv Angle	This field is used to enter the angle value in degrees for the stereoscopic convergence angle. This field is not available on the HelMET IOS window.
Video Output	

Entry	Definition
VR Goggle	This button is used to activate the VR Goggle. VGA (1280x1024) outputs will be present to left and right eyes of the VR Goggle. Note that this button is not available on the HelMET IOS window.
Monitor	This button is used to deactivate the VR Goggle. The video outputs will be switched from 640x480 to 1600x1200 resolution. Prior to pressing the Monitor button, ensure that the power of NVisor SX60 control box is turned off. This will prevent the NVisor SX60 HMD from being damaged. The NVisor SX60 control box is located underneath the motion base wooden structure. Note that this button is not available on the HelMET IOS window.
Window Action Control	
Close Button	The Close button is used to close the Video Settings window.

4.3.1.2.4 Help Window Menu

The Help Window Menu provides a single entry, About HelMET, which shows the software release version of the simulator. An example of the About HelMET window is shown in Figure 12. The Close button is used to close the About HelMET window.

Figure 12 About HelMET Window (IOS)

4.3.1.3 HelMET IOS Main Window Session Control Area

The HelMET IOS Main Window Session Control Area, shown in Figure 6, is located on the right-hand lower corner of the main window. It appears after the HelMET IOS federate is successfully started up. The window provides the HelMET session control functions, which are summarized in Table 21.

Table 21 HelMET IOS Main Window Session Control Functions

Entry	Definition
Initiate Session Button	Used to initiate a new session. This will designate the federate (HelMET IOS) as a master.
Join Session Button	Used to join a new session. This will designate the federate (HelMET IOS) as a slave.
Review Mission Button	Used to review previously recorded missions.
Exit Button	Used to exit from mission training (the whole HelMET IOS program)

Following the selection of the Initiate Session Button, a selection of a Mission Plan Window will be displayed. See Section 4.3.1.18.1.

Following the selection the Review Mission Button, a selection of a Log File Name Window will be displayed. See Section 4.3.1.18.7.

4.3.1.4 HelMET IOS Main Window Start Session Area

The HelMET IOS Main Window Start Session Area, shown in Figure 13, appears after a mission plan is selected and loaded. The figure shown here is the GUI layout for the DLP mission plan.

The window provides the following status and control functions:

- Mission Summary Area

- Session Status Area
- Event Log Area
- Start Session Control Area.

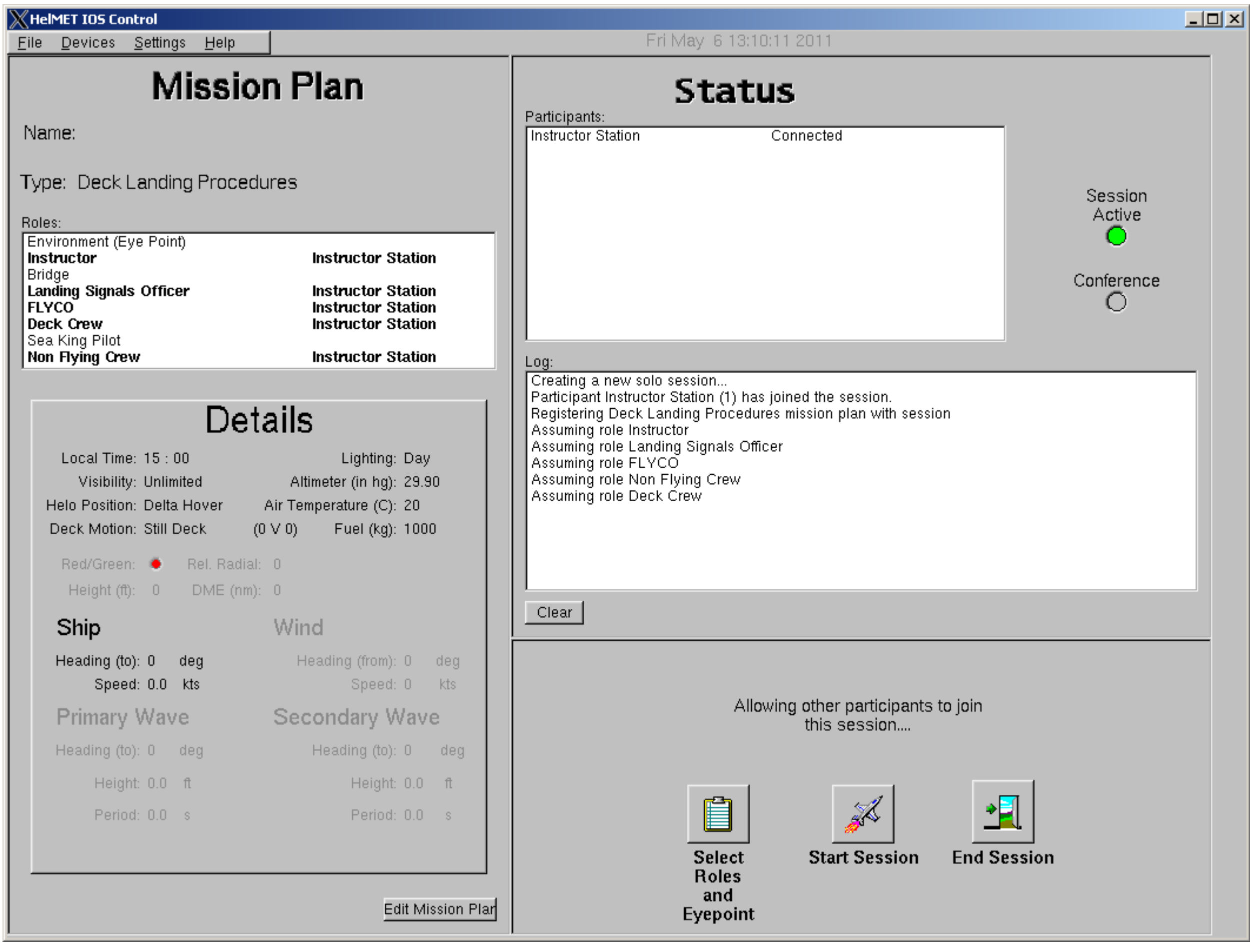


Figure 13 HelMET IOS Main Window Start Session Window

4.3.1.4.1 Mission Summary Area

The HelMET IOS Mission Summary functions are summarized in Table 22.

Table 22 Mission Summary Area

Item	Definition
Name Field	Displays the name of the selected mission plan.
Type Field	Displays the type of mission plan either Deck Landing Procedures or Helicopter Air Maneuvers
Roles Area	Indicates the roles (participants) selected and owned by the federates, HelMET IOS or HelMET Pilot. The bold refers to roles owned by the local federate. The italic refers to role(s) owned by other federate.
Details Area	Displays the mission parameters for the selected mission plan.
Edit Mission Button	Used to edit the currently open mission plan.

4.3.1.4.2 Session Status Area

The HelMET IOS Session Status Area displays the status of the participating federates.

4.3.1.4.3 Event Log Area

The HelMET IOS Event Log Area displays a record of noteworthy events during the session. It is used for diagnostic purposes when a problem is encountered. If everything is running smoothly, the Event Log Area will not be used. The Clear button is used to clear the event log.

4.3.1.4.4 Start Session Control Area

The HelMET IOS Start Session Control functions are summarized in Table 23.

Table 23 Start Session Control Functions

Item	Definition
Select Roles Button	Used to assume or unassume roles. A role that has been assumed by the HelMET IOS will be controlled by the HelMET IOS when running a mission. Role assignment is handled automatically when a participant first connects to the session, but role assignment can be customized through this button. See Figure 22 for role selection window.
Start Session Button	When all participants have joined the session and assumed their desired roles, this button is used to start the session.
End Session Button	Used to end the session and return to the HelMET IOS Main Window.

Following the selection of Select Role Button, a Role Select window will be displayed. See Section 4.3.1.18.2.

Following the selection of Start Session Button, a System Busy window will be displayed. See Section 4.3.1.18.4.

Following the selection of End Session Button, a Session Closed Notification window will be displayed. See Section 4.3.1.18.5.

4.3.1.5 HelMET IOS Mission Control Area

The HelMET IOS Mission Control Area, shown on the right-hand lower corner of Figure 14, Figure 15 and Figure 16, provides the instructor with the functions to control the running of the mission. Detailed descriptions of the control functions are provided in Table 24.

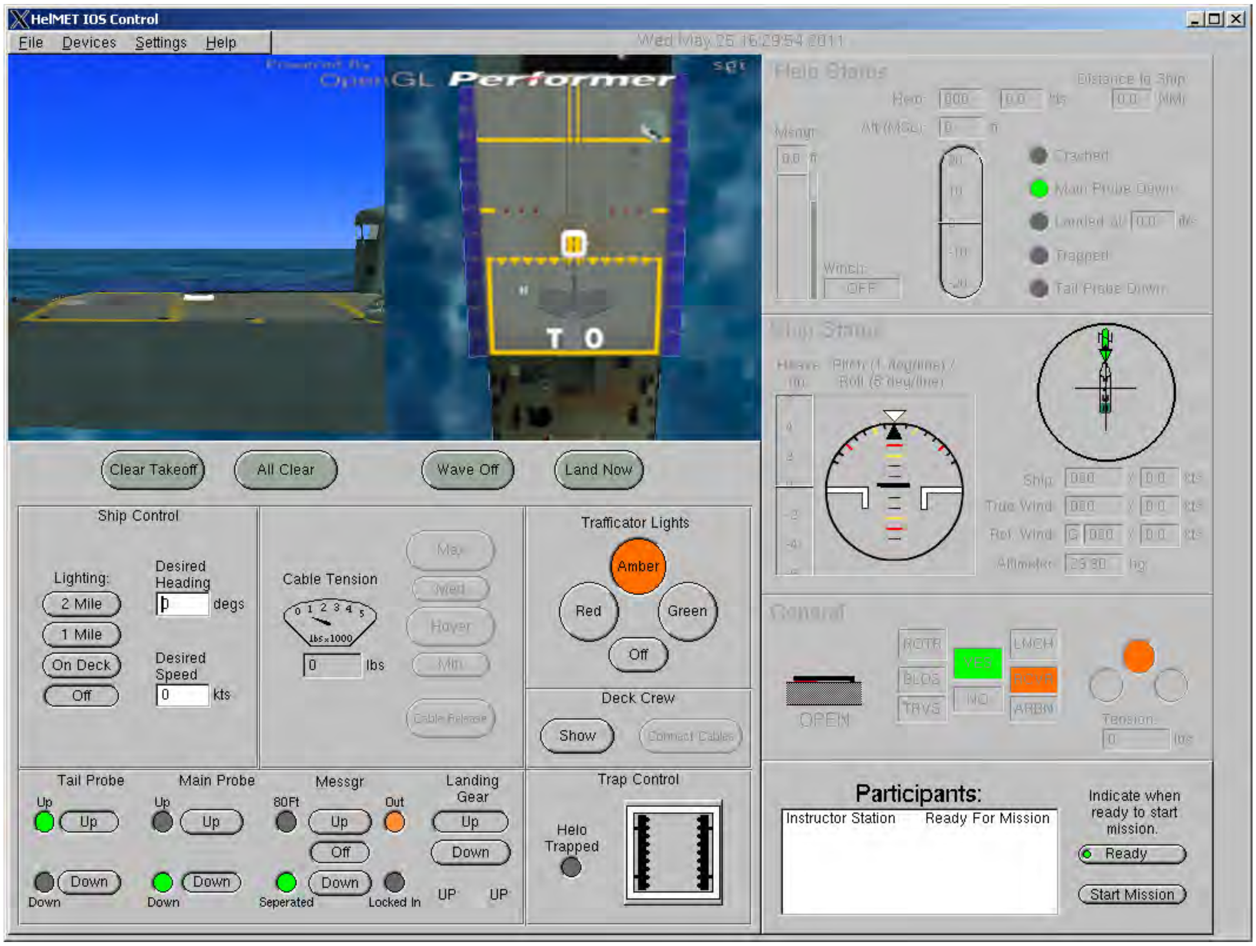


Figure 14 HelMET IOS Main Window at Mission Ready to Start

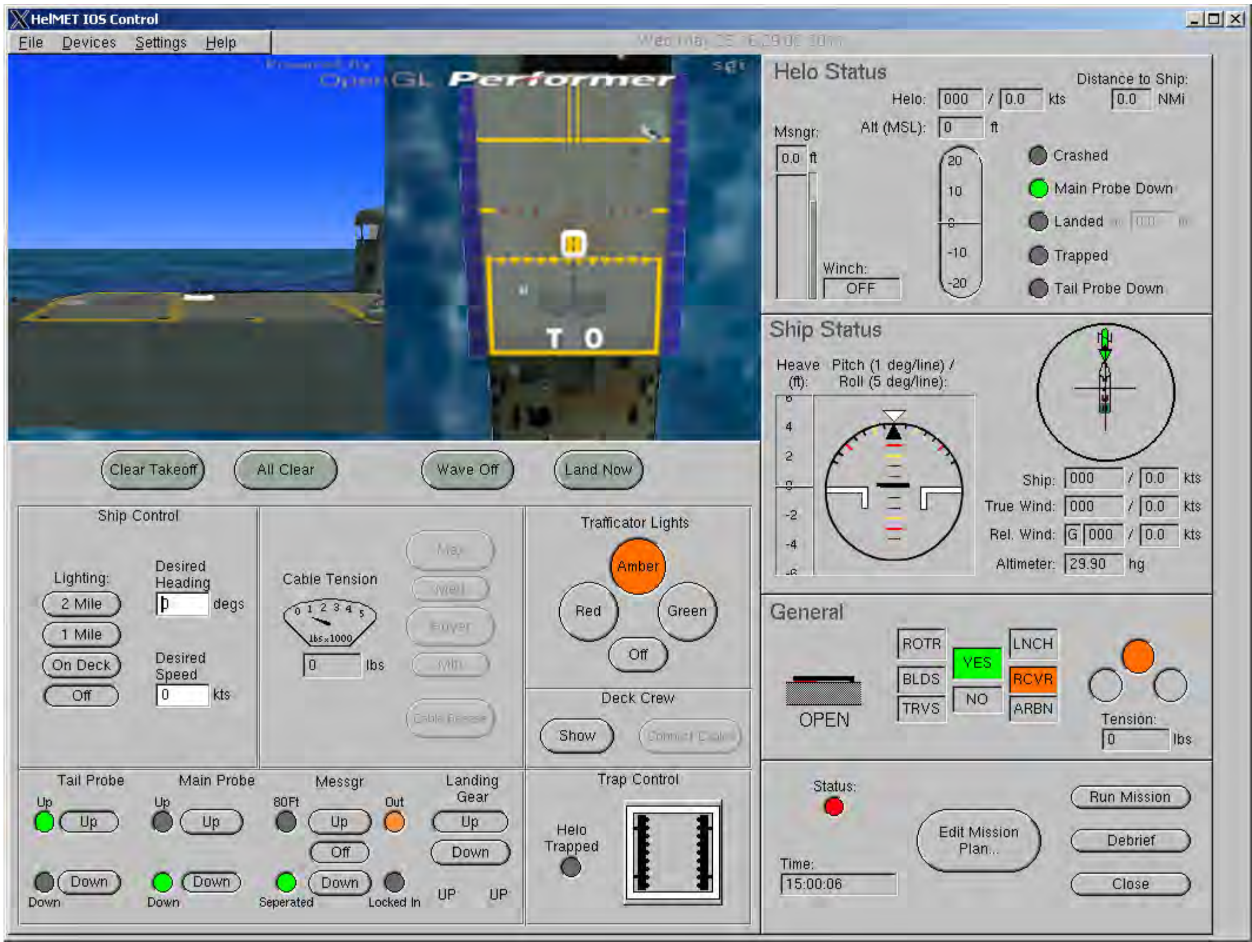


Figure 15 HelMET IOS Main Window at Session Ready to Run

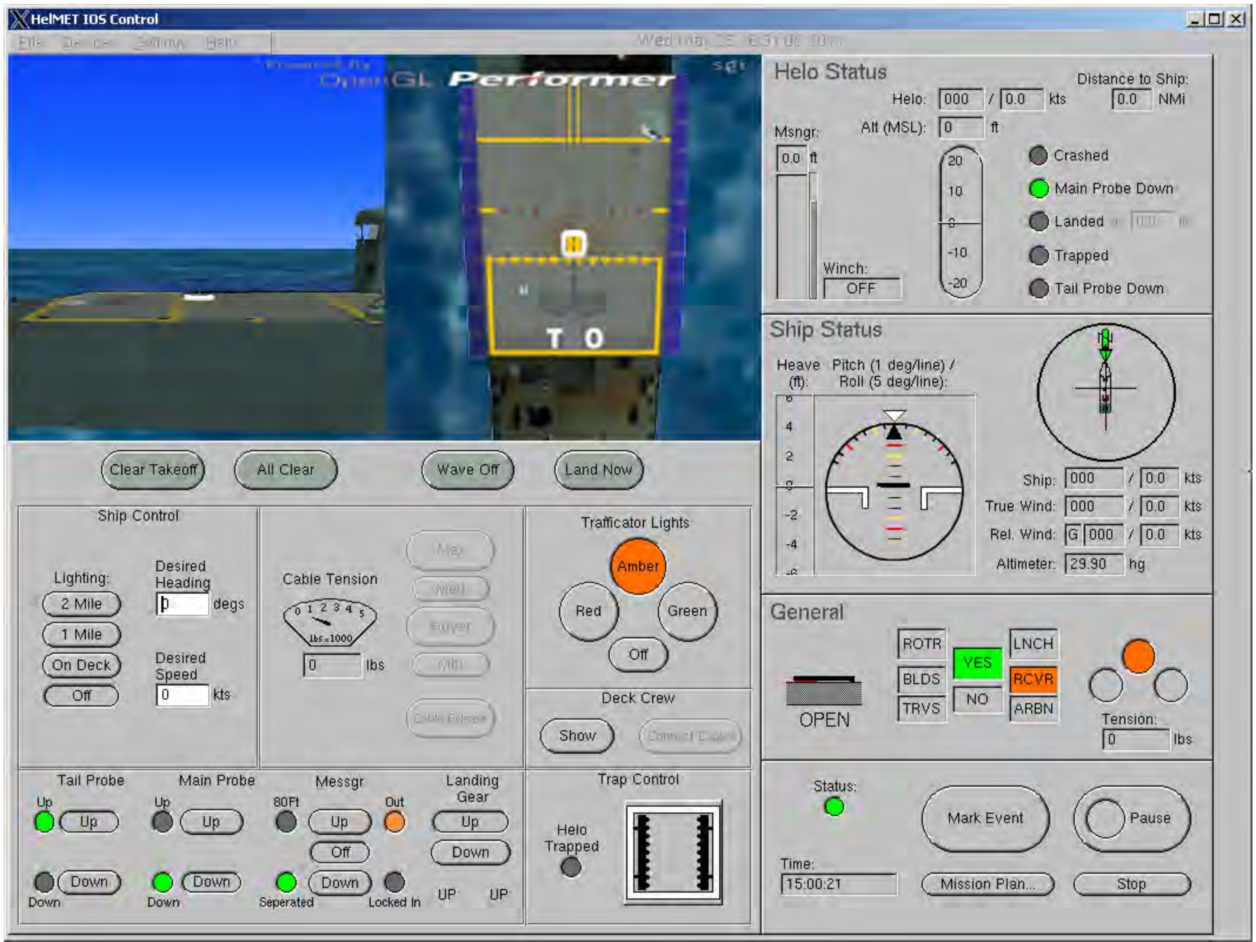


Figure 16 HelMET IOS Main Window at Mission Running

Table 24 Summary of Mission Control Functions

Entry	Definition
Mission Ready to Start (shown on the right-hand lower corner of Figure 14)	
Ready Button	Used to signal that the system is ready to start training.
Start Mission Button	Used to start training for a selected mission.
Mission Ready to Run (shown on the right-hand lower corner of Figure 15)	

Entry	Definition
Mission Status	
Status	Used to indicate the mission status, Green indicating mission running while Yellow indicating mission pause.
Time	Used to display the mission elapsed time.
Mission Controls	
Edit Mission Plan Button	Used to edit the currently selected mission plan.
Run Mission Button	Used to run a mission training session.
Debrief Button	Used to allow the instructor to replay the missions just run.
Close Button	Used to close a mission training session. Following the selection of the Close Button, a Save Mission Data Confirmation window will be displayed. See Section 4.3.1.18.6.
Mission Running (shown on the right-hand lower corner of Figure 16)	
Mark Event Button	Used to mark an event for data storing, which is used in the debrief playback
Pause Button	Used to pause a mission training session.
Stop Button	Used to stop a mission training session.
Mission Plan Button	Used to review a mission plan.

NOTE

At the start of a mission, when the “Ready” and “Start Mission” buttons are enabled, a jump/shift of the synthetic helicopter model within the RSD Trap may occur. The magnitude of the image shift is influenced by the severity of the deck motion and the environmental condition parameters selected for the session. The jump/shift is due to the interrelationships of the different software modules of the device's total software architecture. The jump/shift does not affect the pilot position within the cockpit.

4.3.1.6 HelMET IOS Instructor Display View Area

The Instructor Display View Area, located below the Menu Bar at the top-left corner of HelMET IOS Main Window as shown in Figure 17, allows the instructor to observe the training exercise from a different view (e.g., side view). Some of the available views include:

- Top-down view (right-hand side of the Display View Area)
- Side (Starboard) view (left-hand side of the Display View Area).

The control of the instructor display view can be achieved through the operation of the mouse buttons:

- To zoom view in and out, click and hold the right mouse button and move the mouse up or down.
- To rotate view, click and hold the left mouse button and move the mouse around. Note that this feature only works on the side view.
- To pan view, click and hold the middle mouse button and move the mouse around.

NOTE

The messenger cable, hauldown cable, helicopter probe, helicopter landing gear and avatars are not visually displayed in the Top-down vie. They are functionally present and accurate, but not graphically visible.

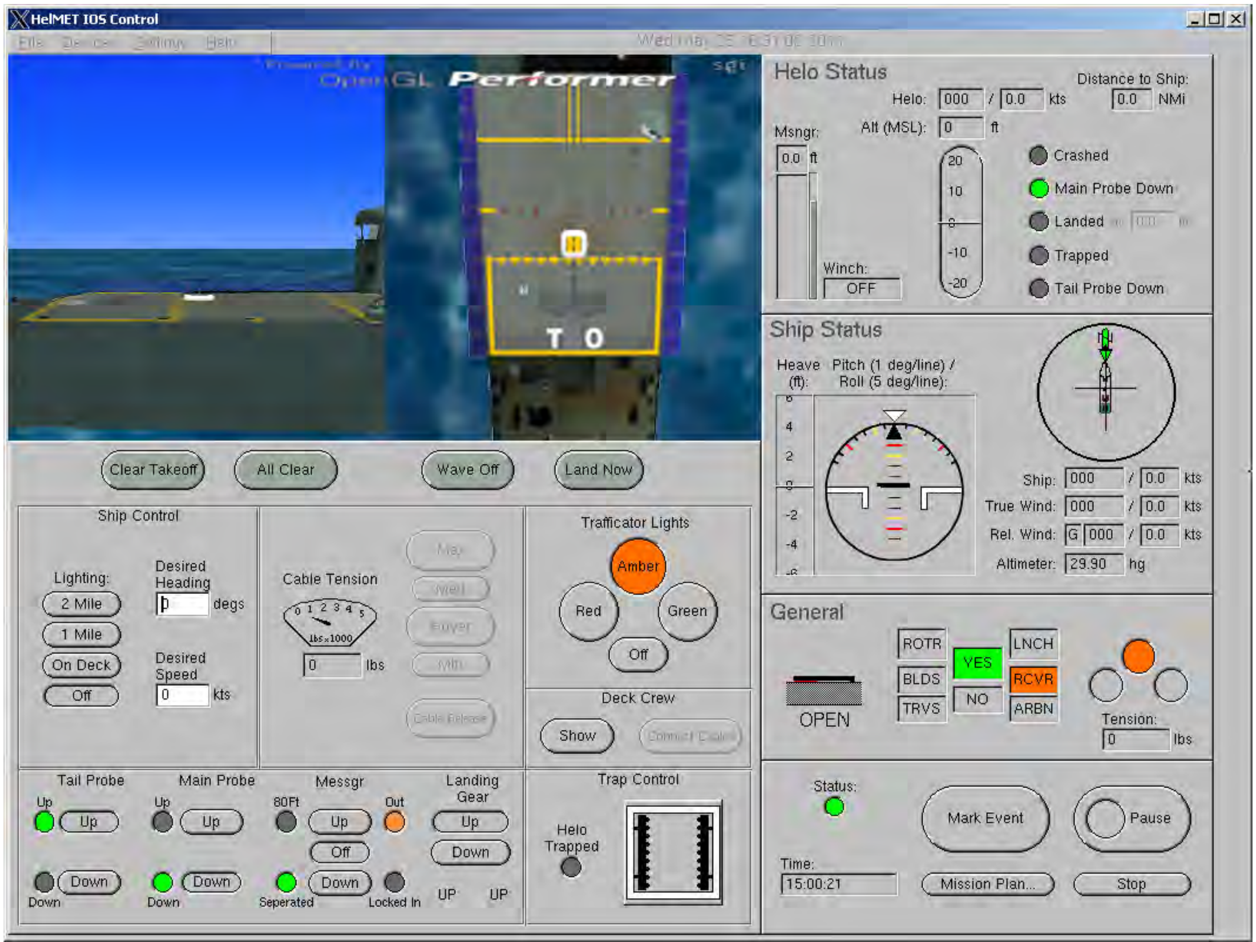


Figure 17 *HelMET IOS Main Window with Integrated Control Panel*

4.3.1.7 HelMET IOS Integrated Control Panel Area

The Integrated Control Panel Area, normally located below the Instructor Display View Area as shown in Figure 17, allows the instructor to perform quick actions for the control of training exercises. These quick actions are summarized in Table 25. The Integrated Control Panel area replaces the LSO Panel, FLYCO Panel, NFC Panel, and Bridge Panel areas when the Instructor, LSO, FLYCO, NFC, and Bridge roles are all selected and owned by the local HelMET IOS federate. Otherwise, control panels for individual roles will be displayed.

The short-cut buttons, 3 Green, Clear Take Off, and Land Now, have been implemented to ease the workload of the IOS Operator during mission training. These buttons provide an instantaneous jump to their final states and do not accurately simulate the time needed to achieve their final states.

Table 25 Instructor Integrated Control Panel Functions

Item	Definition
Shortcut Buttons	
All Clear	This shortcut button allows the instructor to go directly and instantly to the All Clear state. This sets the DSL status to Amber. This button will log an event for debrief.
Cable Release Button	This shortcut button allows the instructor to instantly release the hauldown cable from the helicopter. This button will log an event for debrief.
Clear Take Off Button	This shortcut button allows the instructor to go directly and instantly to the Clear Take Off state. The Clear Take Off signals to raise tail probe, make DSL status Green and open the trap. This button will log an event for debrief.
Wave Off Button	This shortcut button allows the instructor to go directly and instantly to the Wave Off state. The Wave Off signals to set DSL status to Red and detach the hauldown cable from the helicopter. This button will log an event for debrief.
Land Now Button	This shortcut button allows the instructor to go directly and instantly to the Land Now state. The Land Now signals the pilot to land on the ship, set DSL status to Green and apply Maximum cable tension if Three Green is On. This button will log an event for debrief.
Ship Lighting and Motion Controls	
2 Mile Button	Sets the ship lighting to its standard configuration when the helicopter is on approach two miles away.
1 Mile Button	Sets the ship lighting to its standard configuration when the helicopter is on an approach one mile away.
On Deck Button	Sets the ship lighting to its standard configuration when the helicopter has landed on the deck of the ship.

Item	Definition
Off Button (Lighting)	Turns off the ship lighting.
Desired Heading	Used to enter the desired heading angle in degrees for ship control. The valid angle values range from 0 to 359 degrees.
Desired Speed	Used to enter the desired speed in knots for ship control. The valid speed values range from 0 to 40.0 knots.
LSO Hauldown Control	
Cable Tension Dial	Displays the cable tension value in units of 1000 lbs.
Cable Tension Digital Readout	Displays the cable tension value in units of lb.
Max Button	Sets the maximum tension. The maximum tension is set to 4000 lbs.
Med Button	Sets the medium tension. The medium tension is set to 2500 lbs.
Hover Button	Sets the hover tension. The hover tension is 1500 lbs.
Min Button	Sets the minimum tension. The minimum tension is set to 850 lbs.
FLYCO Trafficator Lights	
Red Button	Used by the instructor to set the red trafficator light. The red, amber and green lights are mutually exclusive.
Amber Button	Used by the instructor to set the amber trafficator light. The red, amber and green lights are mutually exclusive.
Green Button	Used by the instructor to set the green trafficator light. The red, amber and green lights are mutually exclusive.
Off Button	Used to turn off the ship trafficator lights.

Item	Definition
NFC Control / Status	
Tail Probe Up Button	Used to set the tail probe in the up position.
Tail Probe Down Button	Used to set the tail probe in the down position.
Tail Probe Up Status	Used to indicate the tail probe is in the up position.
Tail Probe Down Status	Used to indicate the tail probe is in the down position.
Main Probe Up Button	Used to set the main probe in the up position.
Main Probe Down Button	Used to set the main probe in the down position.
Main Probe Up Status	Used to indicate the main probe is in the up position.
Main Probe Down Status	Used to indicate the main probe is in the down position.
Messenger Up Button	Used to raise the messenger cable.
Messenger Down Button	Used to lower the messenger cable.
Messenger Off Button	Used to stop the messenger cable.
Messenger 80FT Status	Used to indicate the messenger cable is in the 80 foot position.
Messenger Separated Status	Used to indicate the messenger cable is in the separated position.
Messenger Out Status	Used to indicate the messenger cable is in the out position.
Messenger Locked In Status	Used to indicate the messenger cable is in the locked in position.
Landing Gear Up Button	Used to set the landing gear in the up position.
Landing Gear Down Button	Used to set the landing gear in the down position.

Item	Definition
Landing Gear Status	Displays the up/Moving/Down state of the landing gear.
Trap Control	
Trap Button	Used to open or close the RSD trap bars. This also displays the open/closed and moving state of the trap.
Helo Trapped Status	Used to indicate whether the helicopter is in the trap or not.

4.3.1.8 HelMET IOS LSO Control Panel Area

The LSO Control Panel Area, normally located below the Instructor Display View Area as shown in Figure 18, allows the instructor to perform various control functions for the Landing Signals Officer. These functions are summarized in Table 26. The LSO Control Panel area is available when the LSO role is selected and the instructor role is not selected.

Figure 18 HelMET IOS Window with LSO Control Panel

Table 26 Selections of LSO Control Panel Functions

Item	Definition
LSO Hauldown Control	
Cable Tension Dial	Used to display the cable tension value in units of 1000 lbs.
Cable Tension Digital Readout	Used to display the cable tension value in units of lb.
None Button	Used by the instructor to reset the tension meter reading to zero.

Item	Definition
+ Button	Used to increment the tension value.
- Button	Used to decrement the tension value.
Max Button	Used to set the maximum tension. The maximum tension is set to 4000 lbs.
Med Button	Used to set the medium tension. The medium tension is set to 2500 lbs.
Hover Button	Used to set the hover tension. The hover tension is set to 1500 lbs.
RA/Min Button	Used to set the minimum tension. The minimum tension is set to 850 lbs.
RSD Control	
Trap Button	Used to open or close the RSD trap bars.
Challenge	
ROTR Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter rotors can be started.
BLDS Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter blades can be extended.
TRVS Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter can traverse to the centre of the flight deck.
OFF Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter is in the hangar.
LNCH Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter is ready for launch. It is also used to turn on or turn off the LAUNCH light.

Item	Definition
RCVR Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter is ready for recovery. It is used to turn on or turn off the RECOVER light.
ARBN Button	Used by LSO to request permission from the Bridge (OOW) whether the helicopter is airborne. It is used to turn on or turn off the AIRBORNE light.

4.3.1.9 HelMET IOS FLYCO Control Panel Area

The FLYCO Control Panel Area, normally located below the LSO Control Panel Area as shown in Figure 18, allows the instructor to perform various control functions for the Flying Coordinator. These functions are summarized in Table 27. The FLYCO Control Panel area is available when the FLYCO role is selected and the instructor role is not selected.

Table 27 Selections of FLYCO Control Panel Functions

Item	Definition
Trafficator Lights	
Off Button	Used to turn off the ship trafficator lights.
Red Button	Used to set the red trafficator light. The red, amber and green lights are mutually exclusive.
Amber Button	Used to set the amber trafficator light. The red, amber and green lights are mutually exclusive.
Green Button	Used to set the green trafficator light. The red, amber and green lights are mutually exclusive.
Deck Lighting	
Deck Lighting	Used to select the lighting on the deck of CPF. The available options are

Item	Definition
Button	Two Miles, One Mile, and On-Deck.

4.3.1.10 HelMET IOS NFC Control Panel Area

The NFC Control Panel Area, normally located below the FLYCO Control Panel Area as shown in Figure 19, allows the instructor to perform various control functions for the Non-Flying Crew. These functions are summarised in Table 28. The NFC Control Panel area is available when the NFC role is selected and the instructor role is not selected.

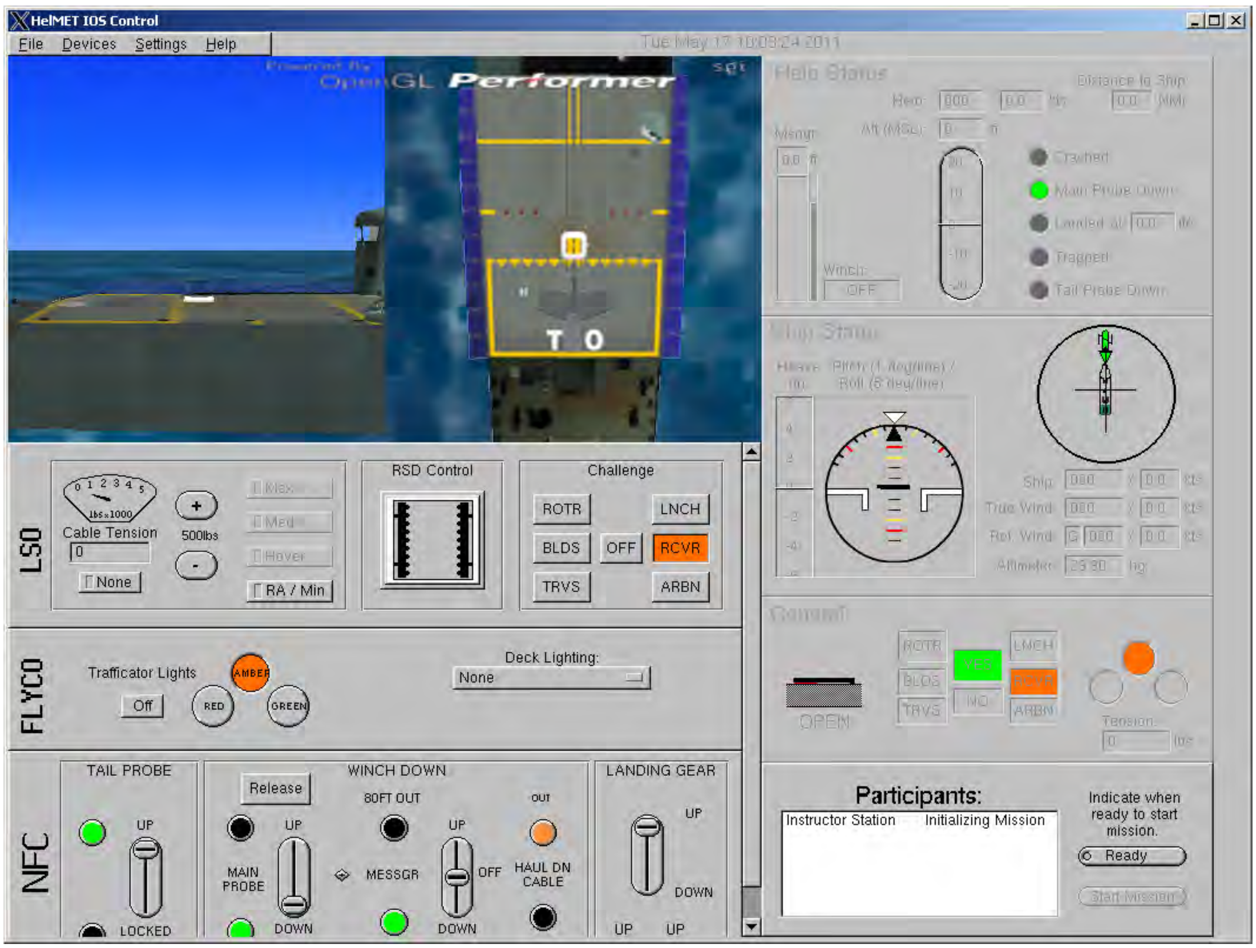


Figure 19 HelMET IOS Window with NFC Control Panel

Table 28 Selections of NFC Control Panel Functions

Item	Definition
Tail Probe	
Tail Probe Switch	Used to set the tail probe in the up or locked-down position.
Tail Probe UP Status	Used to indicate that the tail probe is in the up position.
Tail Probe LOCKED DOWN Status	Used to indicate that the tail probe is in the locked-down position.
Winch	
Release Button	Used to release the messenger cable.
Main Probe Switch	Used to set the main probe in the up or down position.
Main Probe UP Status	Used to move the main probe to the up position.
Main Probe DOWN Status	Used to move the main probe to the down position.
Messenger Switch	Used to move the messenger cable to the down or up position. It is also used to stop the messenger cable.
Messenger 80FT Status	Used to indicate that the messenger cable is in the 80 feet position.
Messenger SEPARATED Status	Used to indicate that the messenger cable is in the separated status.
Messenger Cable OUT Status	Used to indicate that the messenger cable is in the out position.
Messenger Cable LOCKED IN Status	Used to indicate that the messenger cable is in the locked in position.

Item	Definition
Landing Gear	
Landing Gear Switch	Used by the instructor to set the landing gear in the up or down position.
Landing Gear Status	Used to indicate that the landing gear is in the up or down position.

4.3.1.11 HelMET IOS Bridge Control Panel Area

The Bridge Control Panel Area, located below the NFC Panel Area as shown in Figure 19, allows the instructor to perform various control functions for the Officer of the Watch. These functions are summarized in Table 29. The Bridge Control Panel area is available when the Bridge role is selected and the instructor role is not selected.

Table 29 Bridge Control Panel Functions

Item	Definition
Ship Control	
Desired Heading	Used to set the desired heading in degrees for the ship. Valid inputs for the desired heading range from 0 to 359 degrees.
Desired Speed	Used to set the desired speed in knots for the ship. Valid inputs for the desired speed range from 0 to 40 knots.
Challenge Response	
YES Button	Used to respond to a challenge request by activating the YES button.
OFF Button	Used to respond to a challenge request by activating the OFF button.

Item	Definition
NO Button	Used to respond to a challenge request by activating the NO button.

4.3.1.12 HelMET IOS Helicopter Situation Display Area

The Helicopter Situation Display Area, located below the Menu Bar at the top-right corner of HelMET IOS Main Menu, allows the instructor to monitor the helicopter motion and statuses. These display functions are summarised in Table 30.

Table 30 Helicopter Motion and Status Display Functions

Item	Definition
Helicopter Heading Indicator	Displays the helicopter heading angle in degrees.
Helicopter Speed Indicator	Displays the helicopter speed in knots.
Helicopter Altitude Indicator	Displays the helicopter altitude value in feet.
Helicopter Crash Status	Indicates that the helicopter has crashed.
Helo Landed Status	Indicates that the helicopter has landed on the flight deck of a ship.
Helo Trapped Status	Indicates that the helicopter has landed in the trap and the trap has been closed.
Helicopter Descent Rate Indicator	Displays the helicopter descent rate in feet/s. The helicopter's descent rate displayed on the IOS display monitor is synthetic and may not be a representation of the real descent rate.
Winch Status	Displays the winch cable status.
Tail Probe Down Status	Displays whether the Tail Probe is in the down position.

Item	Definition
Main Probe Down Status	Displays whether the Main Probe is in the down position.
Messenger / Deck Height Indicators	The left indicator displays the messenger cable length in feet. The right indicator displays the height of the deck below the helicopter.

4.3.1.13 HelMET IOS Ship Situation Display Area

The Ship Situation Display Area, located below the Helicopter Situation Display Area, allows the instructor to monitor the ship motion and statuses. These display functions are summarised in Table 31.

Table 31 Ship Motion and Status Display Functions

Item	Definition
Ship Orientation Indicator	Displays the ship heading orientation and relative wind direction.
Ship Heading Indicator	Displays the ship heading angle in degrees.
Ship Speed Indicator	Displays the ship speed in knots.
Ship Heave Indicator	Displays the flight deck heave value in feet.
Ship Roll/Pitch Indicator	Displays the ship pitch and roll angles in degrees. On the roll indicator, one notch represents 5 degrees. On the pitch indicator, one notch represents 1 degree.
True Wind Heading Indicator	Displays the true wind heading angle in degrees.
True Wind Speed Indicator	Displays the true wind speed in knots.
Relative Wind Heading Indicator	Displays the relative wind heading angle in degrees.

Item	Definition
Relative Wind Speed Indicator	Displays the relative wind speed in knots.
Altimeter Indicator	Displays the altimeter atmosphere pressure in Hg inch.

4.3.1.14 HelMET IOS General Situation Awareness Display Area

The General Situation Awareness Display Area, located below the Ship Situation Display Area, allows the instructor to observe the situation of a training exercise. These display functions are summarised in Table 32.

Table 32 Situation Awareness Display Functions

Item	Definition
RSD Trap Status	Displays the RSD trap status. The RSD trap is opened when the flag is in the down position while the RSD trap is closed when the flag is in the up position.
ROTR Indicator	Displays the state of the ROTR challenge.
BLDS Indicator	Displays the state of the BLDS challenge.
TRVS Indicator	Displays the state of the TRAVERSE challenge.
YES Indicator	Displays the state of the OOW YES response.
NO Indicator	Displays the state of the OOW NO response.
LNCH Indicator	Displays the state of the LAUNCH challenge.
RCVR Indicator	Displays the state of the RECOVER challenge.

Item	Definition
ARBN Indicator	Displays the state of the AIRBORNE challenge.
Red Light Status	Displays the red trafficator light status.
Amber Light Status	Displays the amber trafficator light status.
Green Light Status	Displays the green trafficator light status.
Tension Indicator	Displays the messenger cable tension value in pounds.

4.3.1.15 Updates to HelMET IOS Windows and Panels

Many of the above HelMET IOS Windows and Panels have been modified to reflect new features including:

- distance to ship indicator
- landing gear status
- pilot and copilot selector indicator lights
- tailprobe and messenger cable state
- RADHAZ indication on the overhead direction indicator

4.3.1.16 HelMET IOS Replay Window Area

The Replay Window, as shown in Figure 20, allows the instructor to replay previously recorded data. The Replay Window provides the following pre-defined data as described in Table 33.

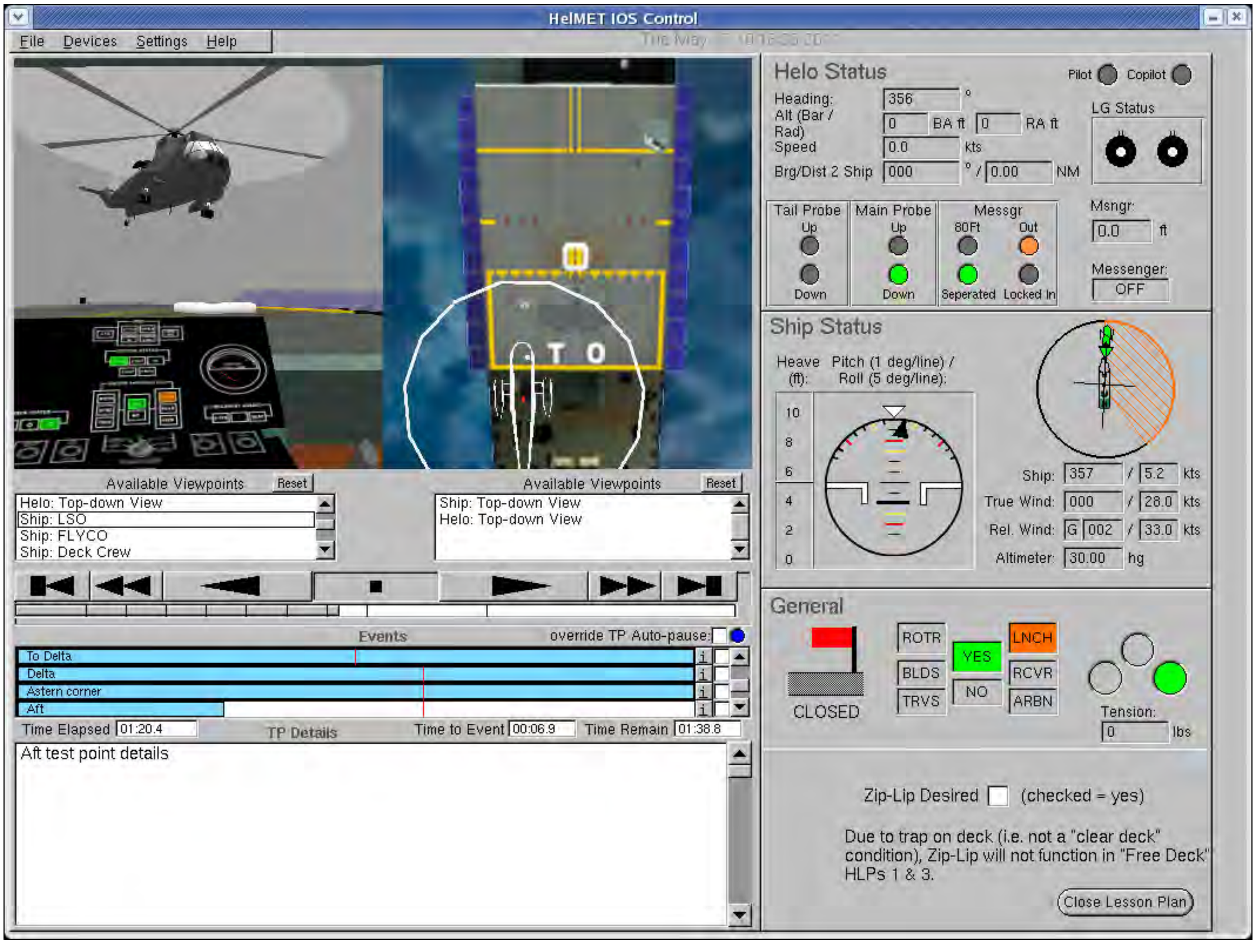


Figure 20 Replay Window

Table 33 Summary of Replay Functions

Entry	Definition
Playback Controls	
End of Backward Playback Button	Used to return to the beginning of the stored data.
Fast Backward Button	Used to replay the stored data in the backward direction at a faster than normal speed.
Backward Button	Used to replay the stored data in the backward direction

Entry	Definition
	at normal speed.
Stop Button	Used to stop replaying of previously recorded data.
Forward Button	Used to replay the stored data in the forward direction at normal speed.
Fast Forward Button	Used to replay the stored data in the forward direction at a faster than normal speed.
End of Forward Playback Button	Used to move to the end of the stored data
View Point Settings	
View Point Selection Switch	Used to select a viewpoint from which to watch the virtual world.
Offset Reset Button	Used to reset the viewpoint to its original position, removing any eyepoint movement made with the mouse.
Mission Status	
Status	Used to indicate the mission status.
Time	Used to display the mission time.
Playback Mission Status and Controls	
Mission	Used to indicate the mission selected for replay.
Total Missions	Used to display total number of missions recorded in the session.
Next Mission	Used to select the next mission for replay.
Load	Used to load data from the selected mission

Entry	Definition
Mission Plan	Used to display the mission plan details.
Window Action Control	
Close Button	Used to close the replay window and return to the main window.

4.3.1.17 Update to the HelMET IOS Replay Window Area

The Replay Window has been updated to provide several new features:

- a split view window
- landing gear status
- pilot and copilot selector indicator lights
- tailprobe and messenger cable state
- RADHAZ indication on the overhead direction indicator
- revised Events panel
- new Training Point (TP) Details panel
- new auto playback feature is networked to automatically start playback on active federates and receive the IOS playback file selection.

4.3.1.18 HelMET IOS Miscellaneous Windows

This is a collection of miscellaneous windows, including:

- Selection of A Mission Plan
- Role Selection
- System Busy
- Session Closed
- Selection of a Log File Name.

4.3.1.18.1 Selection of A Mission Plan

The Selection of a Mission Plan window, shown in Figure 21, allows the instructor to select a mission plan for training. The OK button validates the user selection and closes the Selection of a Mission Plan window. The Cancel button cancels the user selection and closes the Selection of a Mission Plan window.

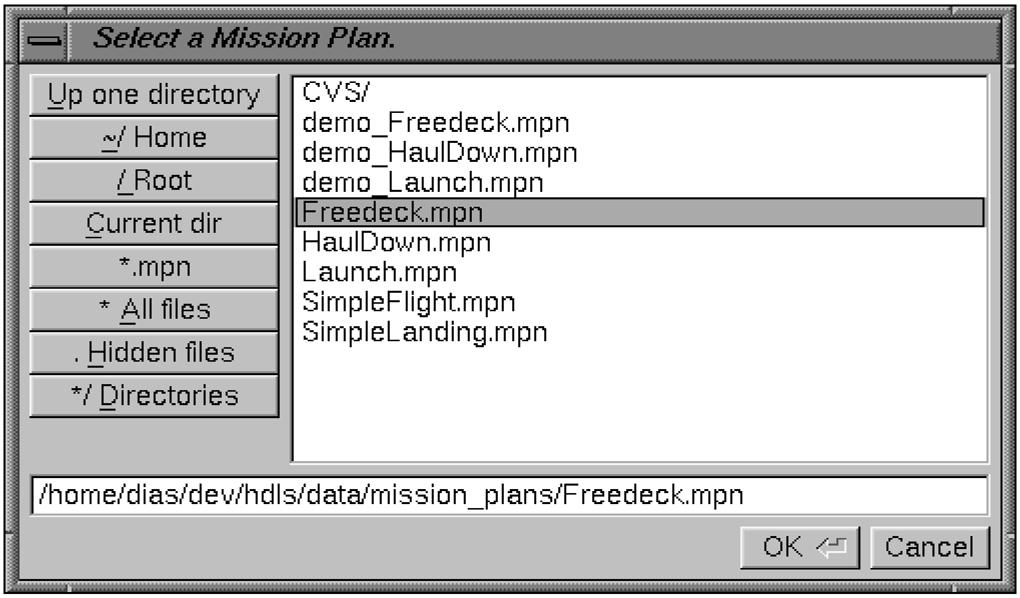


Figure 21 Selection of A Mission Plan Window

4.3.1.18.2 Role Selection

The Role Selection window, shown in Figure 22, allows the instructor to select various roles for a mission. The Unassume button de-selects a previously selected role. The Assume button selects the user-identified role. The Done button closes the Role Selection window.

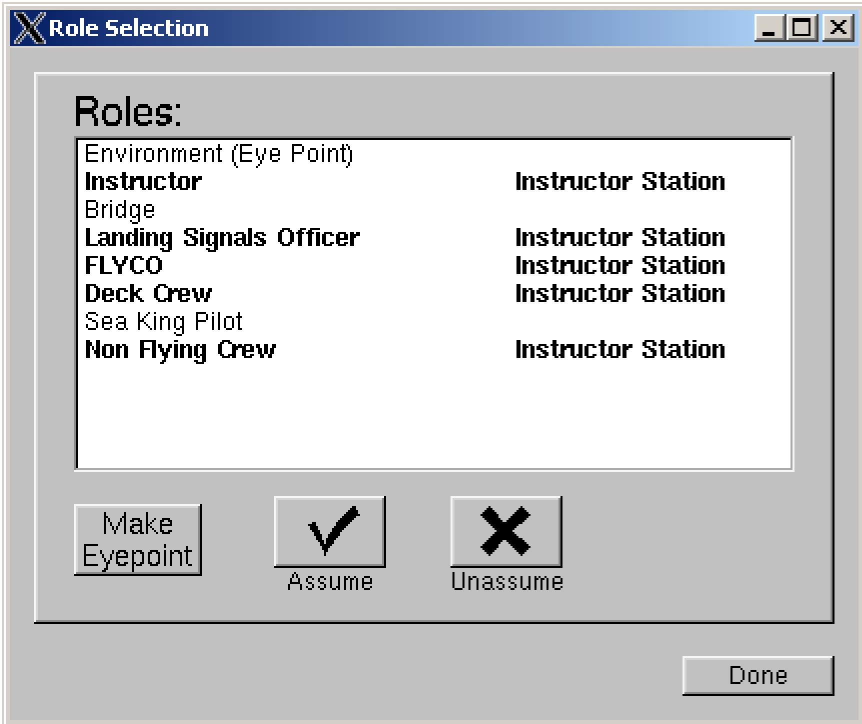


Figure 22 Role Selection Window

4.3.1.18.3 Update to Role Selection

The Role Selection menu has been updated to indicate Instructor Station instead of IOS.

4.3.1.18.4 System Busy

The System Busy window, shown in Figure 23, shows that the system is busy.

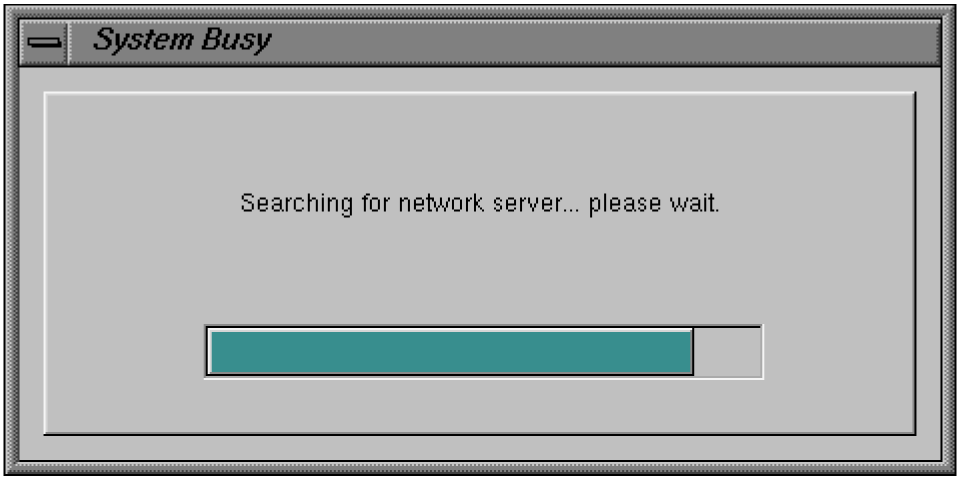


Figure 23 System Busy Window

4.3.1.18.5 Session Closed Notification

The Session Closed Notification window, shown in Figure 24, is posted by the slave federate to inform the instructor that the master federate has closed the session.

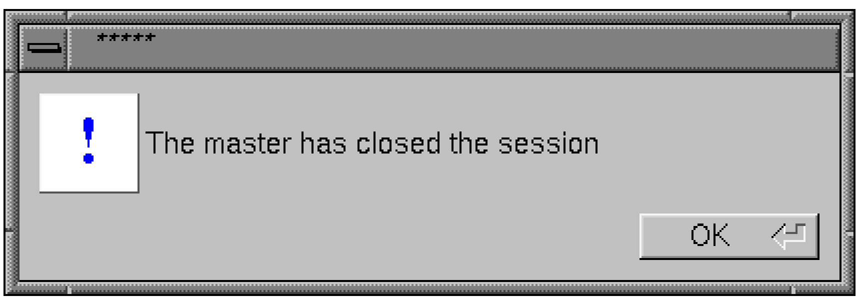


Figure 24 Session Closed Notification Window

4.3.1.18.6 Save Mission Data Confirmation

The Save Mission Data Confirmation window, shown in Figure 25, allows the instructor to confirm saving of mission data. The Yes button is used to save mission data for later review. The No button is used not to save mission data for later review. The Cancel button is used to ignore the action of saving data and close the Save Mission Data Confirmation window.

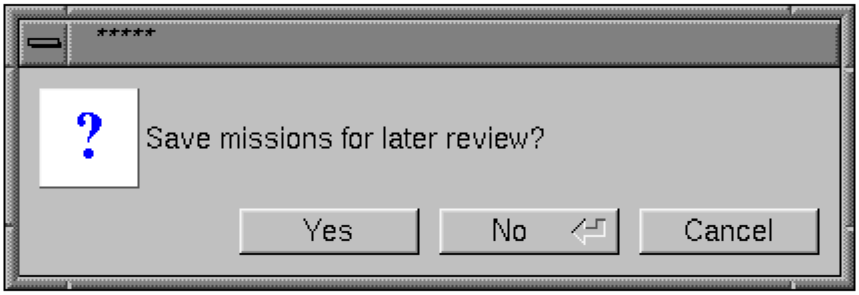


Figure 25 Save Mission Data Confirmation Window

4.3.1.18.7 Selection of a Log File Name

The Selection of a Log File Name, shown in Figure 26, allows the instructor to enter a file name for the log file. The OK button is used to save mission data in the user entered filename. The Cancel button is used to ignore the action and close the Selection of A Log File Name window.

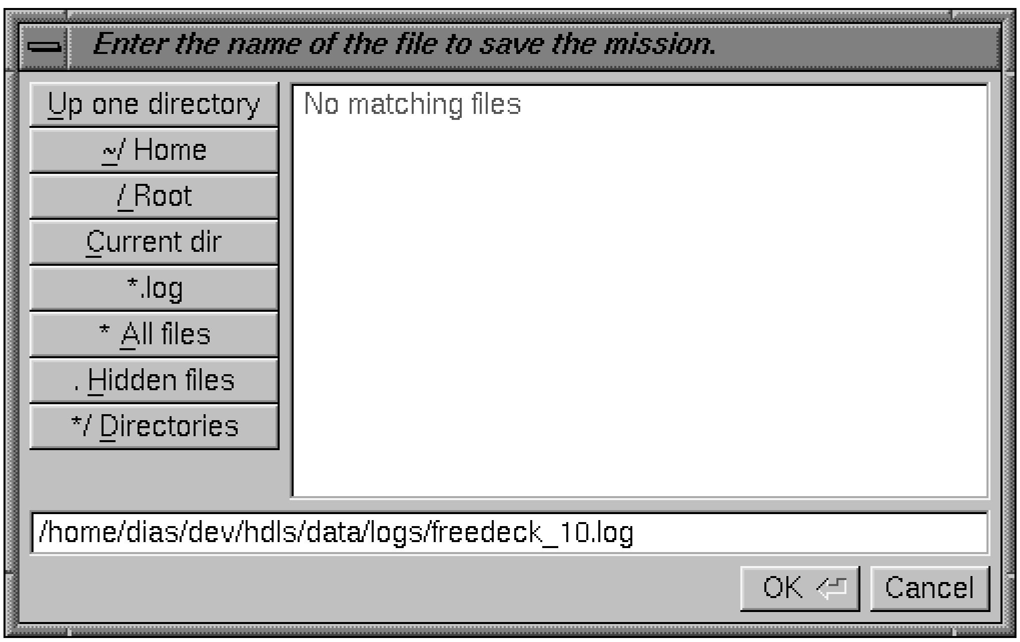


Figure 26 Selection of A Log File Name

4.3.2 HelMET Pilot Control Graphic User Interface

The HelMET Pilot Control Graphic User Interface (GUI) main window, shown in Figure 27, is displayed upon the Pilot federate start up. The HelMET Pilot Control GUI can be divided into the following parts for discussion purposes:

- HelMET Pilot Control Main Window Naming Area
- HelMET Pilot Control Main Window Menu Bar Area
- HelMET Pilot Control Main Window Session Control Area
- HelMET Pilot Control Main Window Mission Control Area
- HelMET Pilot Control Main Window Disconnect Session Control Area
- HelMET Pilot Control Hardware Device Status and Control Area
- HelMET Pilot Control Miscellaneous Windows.

Figure 27 HelMET Pilot Control Main Window At Start-up

4.3.3 Update to the HelMET Pilot Control Graphic User Interface

The HelMET Pilot Control Interface has been updated with the following:

- Conferencing has become Headset Audio
- Controllable visibility of all device status except for the platform
- new Exercise menu for VLP

4.3.3.1 HelMET Pilot Control Main Window Naming Area

The HelMET Pilot Control Window Naming Area is located at the top of the window. It includes the following components:

- Window Menu Button
- Title Bar
- Minimize Button.

These components are described in Section 4.3.1.1.

4.3.3.2 HelMET Pilot Control Main Window Menu Bar Area

The HelMET Pilot Control Main Window Menu Bar area is located below the HelMET Pilot Control Window Naming Area. It includes the following five window menus:

- File
- Devices
- Settings
- Tools
- Help.

4.3.3.2.1 File Window Menu

The File Window menu is used to display the list of actions for file operations. The File Window Menu components are described in Section 4.3.1.2.1.

4.3.3.2.2 Devices Window Menu

The Devices Window menu is used to display the list of actions for the setting and control of hardware devices. The Window Menu includes the following entries, as described in Table 34.

Table 34 Devices Window Menu

Entry	Definition
Motion Platform Device	Allows the instructor to set and control the motion platform device.
Head Tracker	Allows the instructor to set, connect, and control the tracker device.
Cereal Box	Allows the instructor to set, connect, and control the Cereal Box device.
Audio Effects	Allows the instructor to set and control the audio devices.
Audio Conference	Allows the instructor to set, connect, and control the audio conference devices.

4.3.3.2.2.1 Motion Platform Window

The Motion Platform window, shown in Figure 28, allows the instructor to start or stop the motion platform device. The window provides the following functions, as described in Table 35.

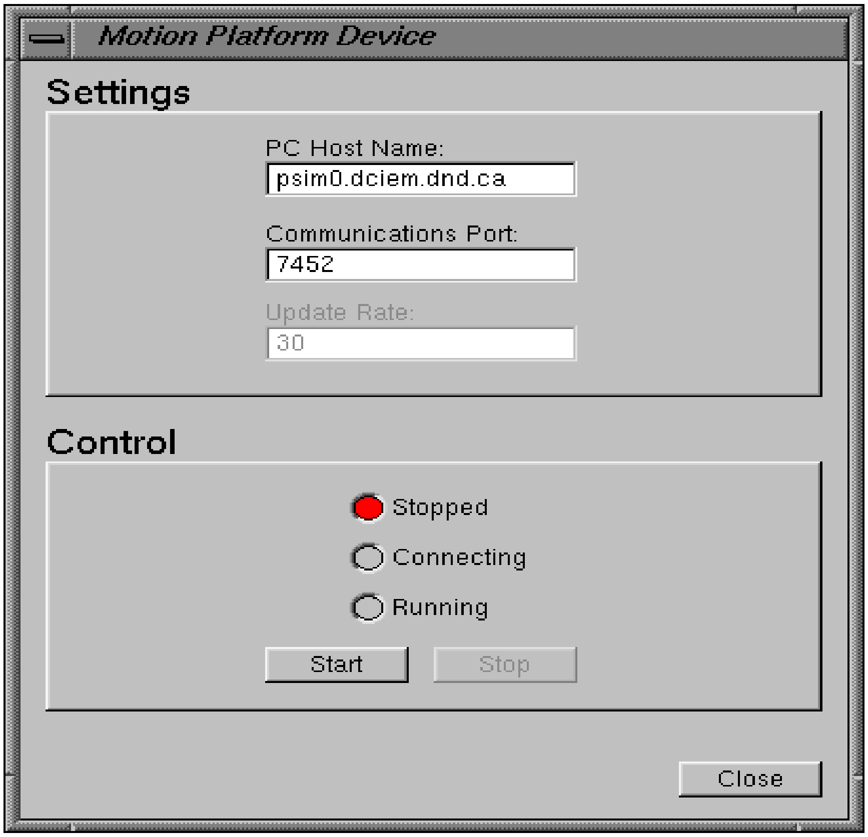


Figure 28 Motion Platform Device Window

Table 35 Motion Platform Device Functions

Entry	Definition
Settings	
PC Host Name	Used to enter and display the PC host name.
Communication Port:	Used to enter and display the PC host port number.
Update Rate	Used to enter the motion platform update rate in Hz.
Control	

Entry	Definition
Stopped	Used to indicate that the motion platform device process has stopped running.
Connecting	Used to indicate that the motion platform device process is connecting to the server computer.
Running	Used to indicate that the motion platform device process is running.
Start Button	Used to start the motion platform device process.
Stop Button	Used to stop the motion platform device process.
Window Action Control	
Close Button	Used to close the motion platform device window.

4.3.3.2.2.2 Head Tracker Window

The Head Tracker window, shown in Figure 29, allows the instructor to set, connect, and control the header tracker device. The window includes the following selections as described in Table 36.

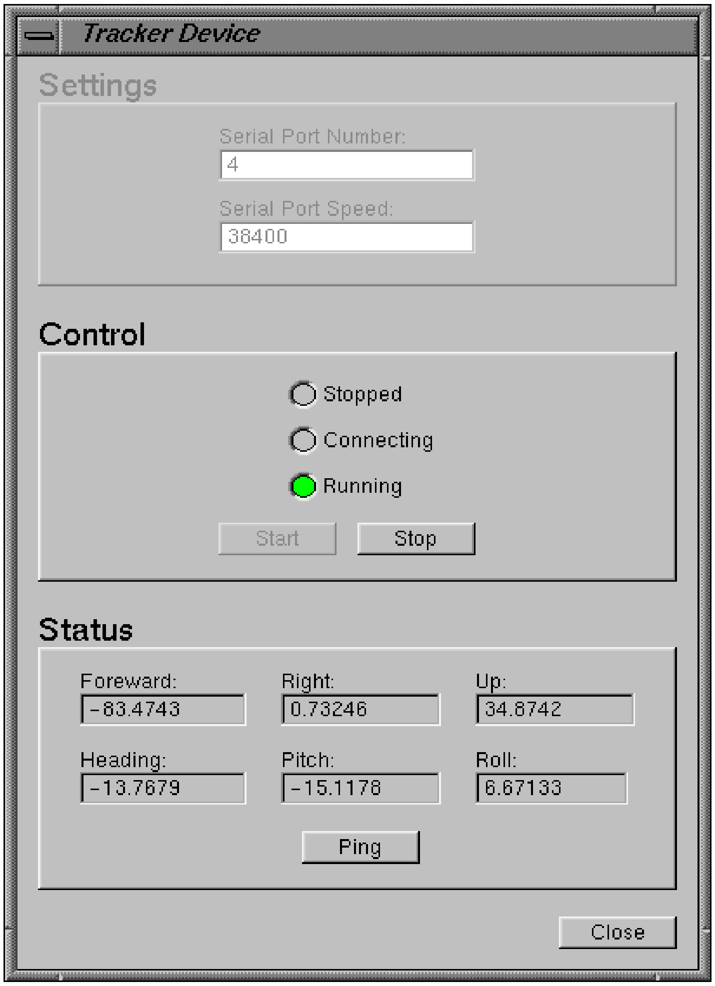


Figure 29 Head Tracker Device Window

Table 36 Head Tracker Device Functions

Entry	Definition
Settings	
Serial Port Number	Used to enter and display the PC host port number
Serial Port Speed	Used to enter and display the PC host serial port speed value in baud

Entry	Definition
Control	
Stopped	Used to indicate that the head tracker device process has stopped running.
Connecting	Used to indicate that the head tracker device process is connecting to the server computer.
Running	Used to indicate that the head tracker device process is running.
Start Button	Used to start the head tracker device process.
Stop Button	Used to stop the head tracker device process.
Status	
Forward Status	Used to display the forward offset value.
Right Status	Used to display the right offset value.
Up Status	Used to display the up offset value.
Heading Status	Used to display the heading angle value.
Pitch Status	Used to display the pitch angle value.
Roll Status	Used to display the roll angle value.
Ping Button	Used to obtain the head tracker process status.
Window Action Control	
Close Button	Used to close the head tracker device window.

4.3.3.2.2.3 Cereal Box Device Window

The Cereal Box Device window, shown in Figure 30, allows the instructor to set and control the CerealBox device. The window provides the selections as described in Table 37.

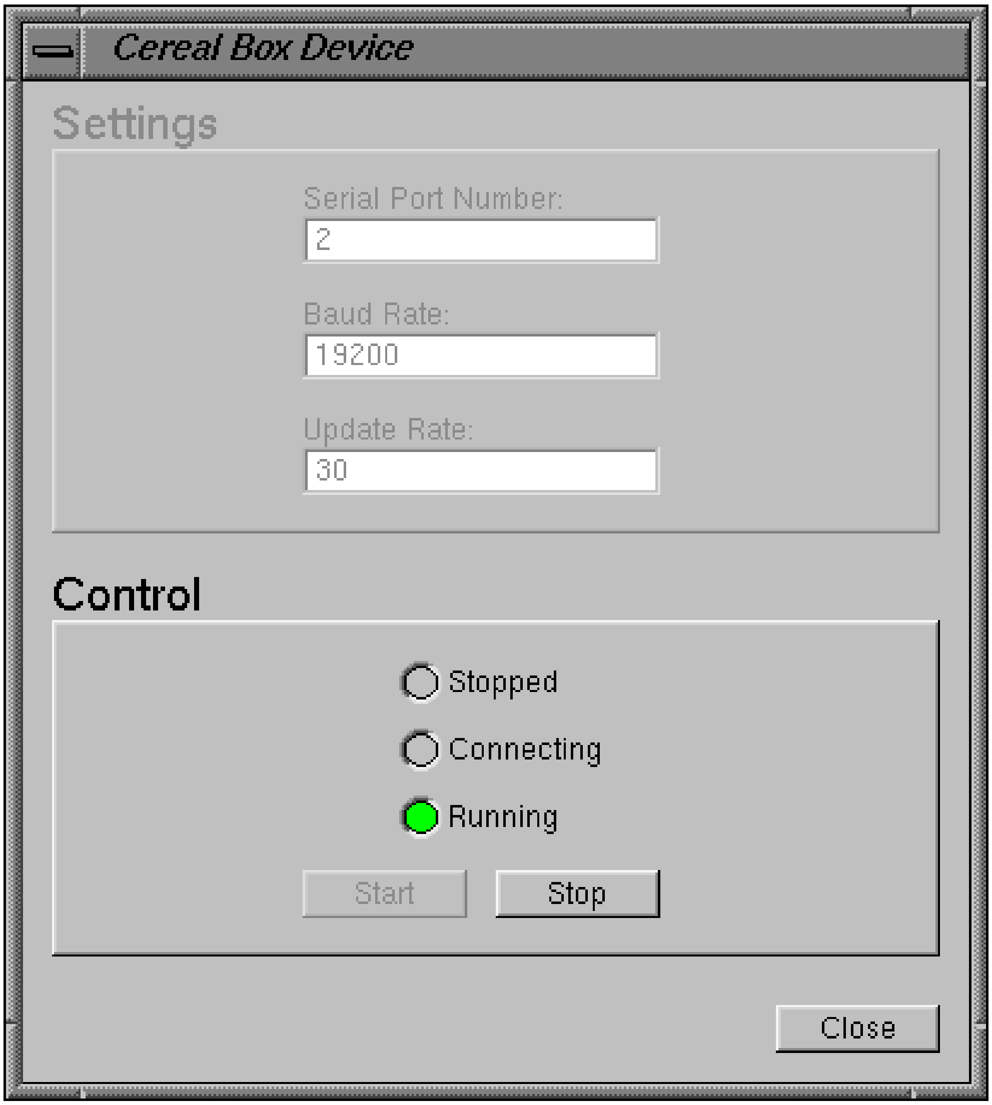


Figure 30 Cereal Box Device Window

Table 37 CerealBox Device Functions

Entry	Definition
Settings	
Serial Port Number	Used to enter and display the PC host port number
Baud Rate	Used to enter and display the PC host serial port speed value.
Update Rate	Used to enter the update rate of the CerealBox device in Hz.
Control	
Stopped	Used to indicate that the CerealBox device process has stopped running.
Connecting	Used to indicate that the CerealBox device process is connecting to the server computer.
Running	Used to indicate that the CerealBox device process is running.
Start Button	Used to start the CerealBox device process.
Stop Button	Used to stop the CerealBox device process.
Window Action Control	
Close Button	Used to close the CerealBox device window.

4.3.3.2.2.4 Audio Effects Window

The Audio Effects Device window, shown in Figure 31, allows the instructor to set and control the Audio Effects device. The window includes the following selections as described in Table 38.

Figure 31 Audio Effects Device Window

Table 38 Audio Effects Device Functions

Entry	Definition
Settings	
Communication Port	Used to enter and display the PC host port number

Entry	Definition
PC Host Name	Used to enter and display the PC host name.
Control	
Stopped	Used to indicate that the Audio Effects device process has stopped running.
Connecting	Used to indicate that the Audio Effects device process is connecting to the server computer.
Running	Used to indicate that the Audio Effects device process is running.
Start Button	Used to start the Audio Effects device process.
Stop Button	Used to stop the Audio Effects device process.
Status	
Play Test Sound Button	Used to play a test sound pattern.
Volume Control	Used to adjust the sound volume.
Mute Button	The Mute button is used to turn off the sound volume.
Window Action Control	
Close Button	The Close button is used to close the Audio Effects device window.

4.3.3.2.3 Settings Window Menu

The Settings Window menu is used to display the list of window actions for the video settings. The Window Menu includes the following entries as described in Table 39.

Table 39 Settings Window Menu

Entry	Definition
Video Settings	Allows the instructor to set and control the eye point, field of view, stereoscopic, statistics and rendering.

4.3.3.2.3.1 Video Setting Window

See 4.3.1.2.3.1.

4.3.3.2.4 Tools Window Menu

The Tools Window menu is used to display the list of window actions for the flight control settings.

4.3.3.2.4.1 Flight Controls Window

The Flight Controls Window, shown in Figure 32, allows the instructor to set and control the helicopter position and speed, pedals, collective pitch stick and cyclic pitch stick. The window includes the following selections as described in

Table 40.

- Set the helicopter’s position and orientation
- Set the helicopter’s speed
- Set the positions of the tail rotor left and right pedals
- Control the collective pitch stick position
- Control the cyclic pitch stick positions
- Enable/disable the helicopter radio and ICS controls
- Enable/disable the CerealBox Override for the flight control interface.

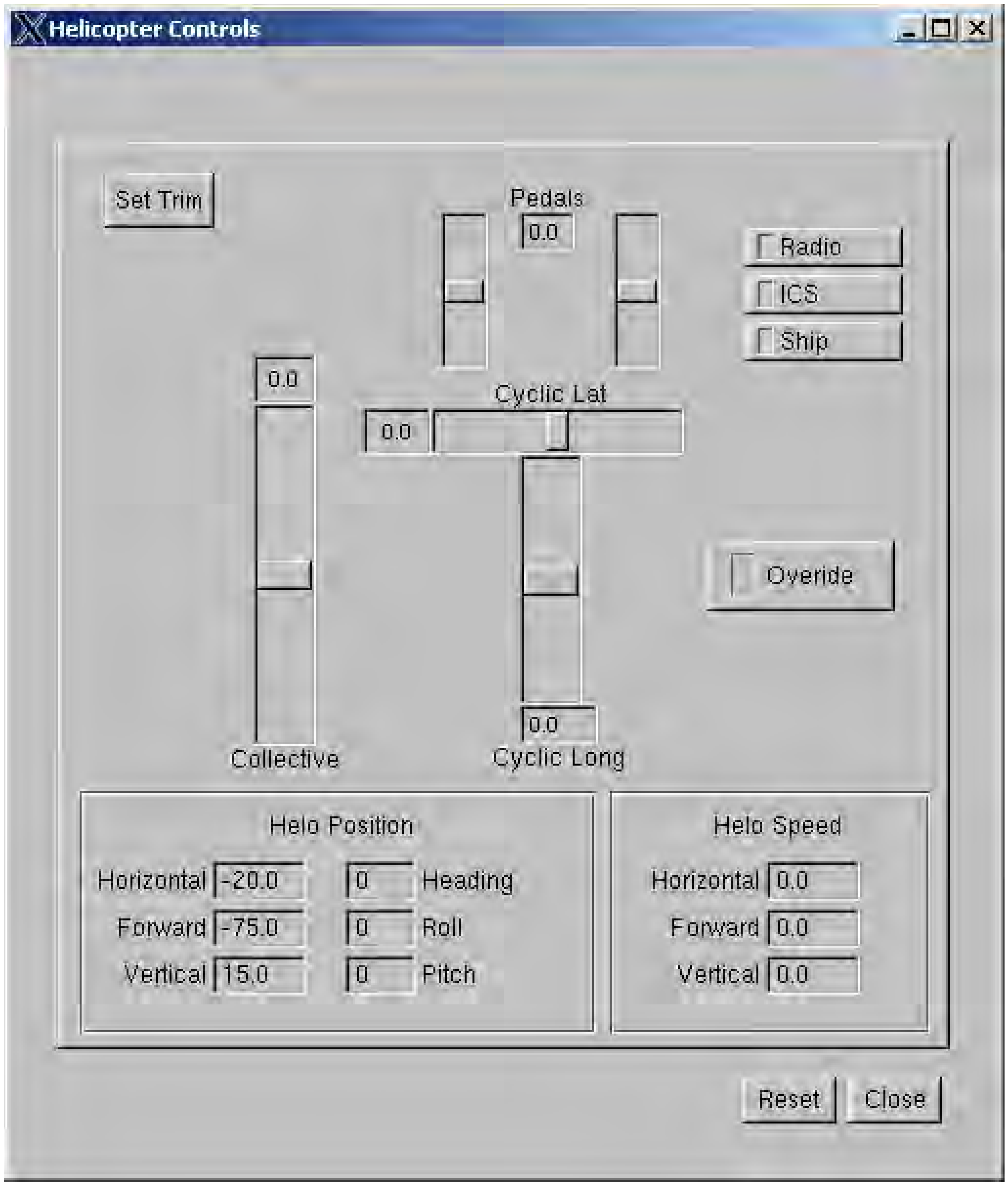


Figure 32 Flight Control Window

Table 40   Flight Control Functions

Entry	Definition
Radio/Inter-Communication System	
Radio Button	Used to enable the radio communication functions.
ICS Button	Used to enable the Inter-Communication System.
CerealBox Overide	
CerealBox Override Button	Used to override the CerealBox interface data. When the CerealBox Override is Off, the Collective, Cyclic (Lat/Long) and Pedals (Left/Right) display show the position of the physical flight controls. When the CerealBox Override is On, the Collective, Cyclic (Lat/Long) and Pedals (Left/Right) sliders control the flight controls of the helicopter. Note that the CerealBox Overide button will not work unless the CerealBox is stopped through the CerealBox device window.
Flight Controls	
Set Trim Button	Used to set the cyclic pitch stick trim values.
Pedals	Used to set the left and right pedal positions.
Collective	Used to set the collective pitch lever position.
Cyclic Lat	Used to set the cyclic pitch stick lateral position.
Cyclic Long	Used to set the cyclic pitch stick longitudinal position.
Helo Positions	
Horizontal	Used to display the helicopter horizontal position.
Forward	Used to display the helicopter forward position.

Entry	Definition
Vertical	Used to display the helicopter vertical position.
Heading	Used to display the helicopter heading value.
Roll	This field is display to set the helicopter roll value.
Pitch	Used to display the helicopter pitch value.
Helo Speed	
Horizontal	Used to display the helicopter horizontal speed.
Forward	Used to display the helicopter forward speed.
Vertical	Used to display the helicopter vertical speed.
Window Action Controls	
Reset	Used to reset all settings to the original values.
Close Button	Used to close the Flight Control window

.

4.3.3.2.4.2 Update to the Flight Controls Window

The Flight Controls Window has been updated with the addition of a Ship button to the mutually exclusive radio button group which already includes the ICS and Radio selections.

4.3.3.2.5 Help Window Menu

The Help Window Menu provides a single entry, About HelMET, which shows the software release version of the simulator. An example of the About HelMET window is shown in Figure 33. The Close button is used to close the About HelMET window.

Figure 33 About HelMET Window (Pilot)

4.3.3.3 HelMET Pilot Control Main Window Session Control Area

The HelMET Pilot Control Main Window Session Control Area, shown on the right hand side of Figure 27, provides the session control functions, which are summarized in Table 41.

Table 41 HelMET Pilot Control Main Window Session Control Functions

Entry	Definition
Initiate Session Button	Used to initiate a new session. This will designate the HelMET Pilot as a master federate.
Join Session Button	Used to join a new session. The joined federate will be designated as a slave federate.
Review Missions Button	Used to review mission recorded in previous missions.
Exit Button	Used to exit from a training session.

Following the selection of Join Session Button, the HelMET Pilot federate will join the HelMET federation as a participant. A System Busy window will be displayed for a few minutes.

4.3.3.4 HelMET Pilot Control Main Window Mission Control Area

The HelMET Pilot Control Main Window Mission Control functions are summarized in Table 42.

Table 42 HelMET Pilot Control Main Window Mission Control Functions

Entry	Definition
Ready Button	Used to signal that the system is ready to start training, when the Ready button is shown in Green. See Figure 35. Following the selection of Ready button, the Start Mission button will be displayed. Following the selection of the Start Mission button, a Pilot Reminder window will be displayed.
Start Mission Button	Used to start a training mission.
Stop Button	Used to stop a training mission.
Close Button	Used to exit a training session.

4.3.3.5 HelMET Pilot Control Main Window Disconnect Session Control Area

The HelMET Pilot Control Main Window Disconnect Session Control functions, shown in Figure 34, are summarized in Table 43.

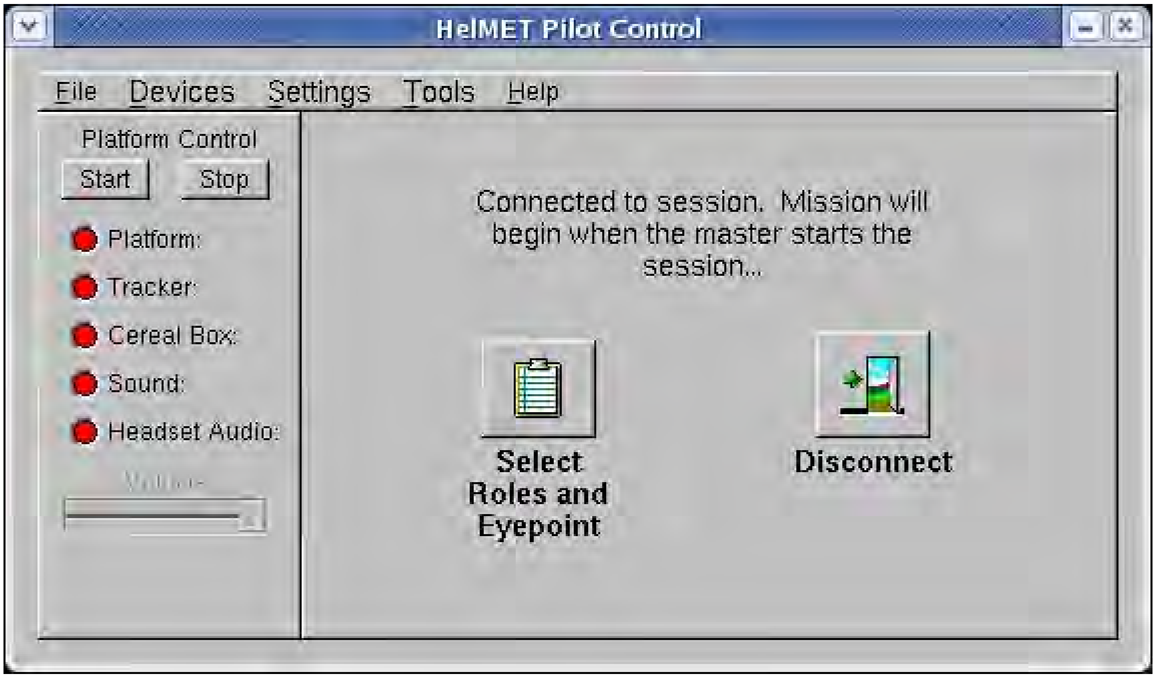


Figure 34 HelMET Pilot Control Disconnect Session Control

Table 43 HelMET Pilot Control Main Window Start Session Control Functions

Entry	Definition
Select Roles Button	Used to initiate the role selection.
Disconnect Button	Used to disconnect from a session.

4.3.3.6 HelMET Pilot Control Hardware Device Status and Control Area

The HelMET Pilot Control Hardware Device Status and Control Area shown in Figure 35, allows the instructor to perform quick actions for the control of training exercises. These quick actions are summarized in Table 44.

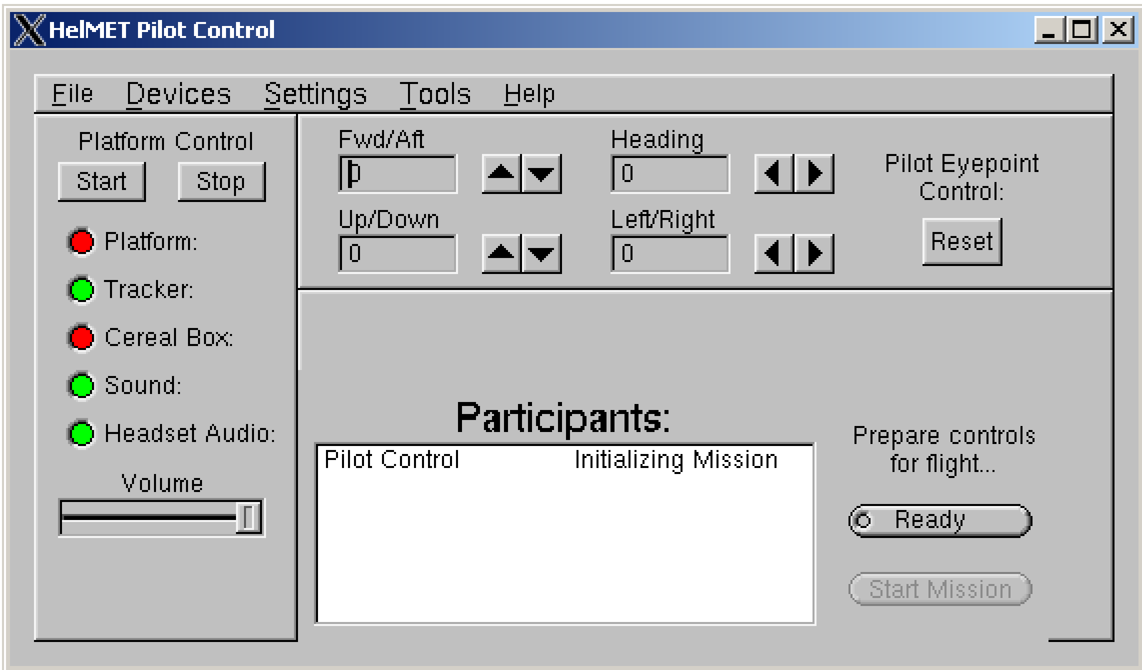


Figure 35 HelMET Pilot Control Hardware Device Status and Control Functions

Table 44 HelMET Pilot Control Hardware Device Status and Control Functions

Item	Definition
Platform Control	
Start Button	Allows the instructor to activate the motion platform. When the Start button is pressed, a Motion Platform Reminder window will be displayed to remind the user for the proper operation of the motion platform. See Section 4.3.3.7.3
Stop Button	Allows the instructor to deactivate the motion platform.
Status	

Item	Definition
Platform Status	Indicates the motion platform status. Green status indicates that the motion platform is operational. Red status indicates that the motion platform is not operational.
Tracker Status	Indicates the head-mounted tracker status. Green status indicates that the tracker is operational. The red status indicates that the tracker is not operational.
CerealBox Status	Indicates the CerealBox status. Green status indicates that the CerealBox is operational. Red status indicates that the CerealBox is not operational.
Audio Status	Indicates the audio/helo noise status. Green status indicates that the audio is operational. Red status indicates that the audio is not operational.
Conference Status	Indicates the audio communication status. Green status indicates that the audio communication is operational. Red status indicates that the audio communication is not operational.
Sound Volume Control	
Volume Control	Allows the instructor to control the sound volume.
Pilot Eye Point Control	
Fwd/Aft	Allows the instructor to adjust the pilot eye point in the forward and aft directions.
Heading	Allows the instructor to adjust the pilot eye point in the heading direction.
Up/Down	Allows the instructor to adjust the pilot eye point in the up and down directions.
Left/Right	Allows the instructor to adjust the pilot eye point in the left and right directions.

Item	Definition
Reset	Allows the instructor to reset the pilot eye points to the preset positions.
Mission Control	
Participant Status	Used to indicate the initialization and readiness statuses of participants (IOS and Pilot federates)
Ready Status / Button	Used to signal that the system is ready to start training, when the green Ready button is displayed. Following the selection of the Ready button, the Start Mission button will be displayed. Following the selection of the Start Mission button, a Pilot Reminder window will be displayed.

4.3.3.7 HelMET Pilot Control Miscellaneous Windows

This is a collection of miscellaneous windows, including:

- System Busy
- Pilot Reminder
- Motion Platform Reminder

4.3.3.7.1 System Busy

The System Busy window, shown in Figure 36, shows that the system is busy.

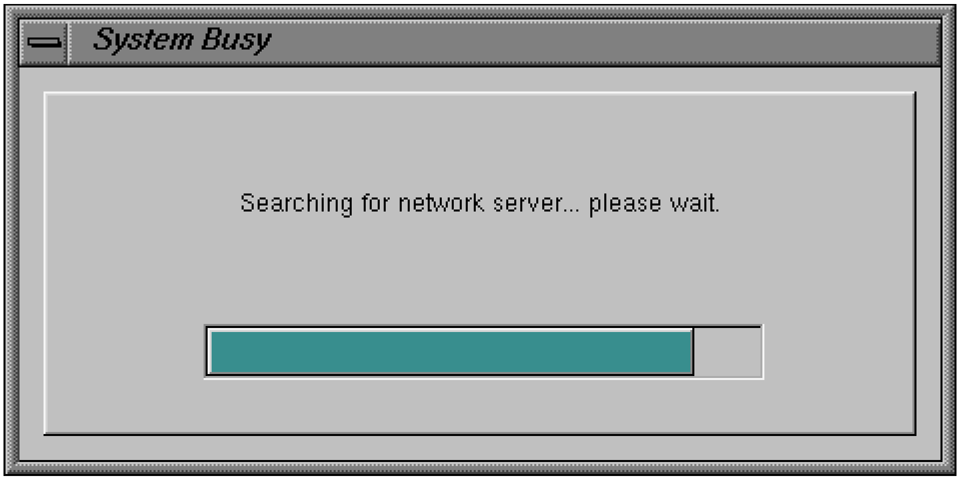


Figure 36 System Busy Window

4.3.3.7.2 Pilot Reminder Window

The Pilot Reminder window, shown in Figure 37, reminds the instructor to verify with the pilot prior to a training mission. The Yes button confirms the verification and closes the Pilot Reminder window. The No button does not confirm the action and closes the Pilot Reminder window.

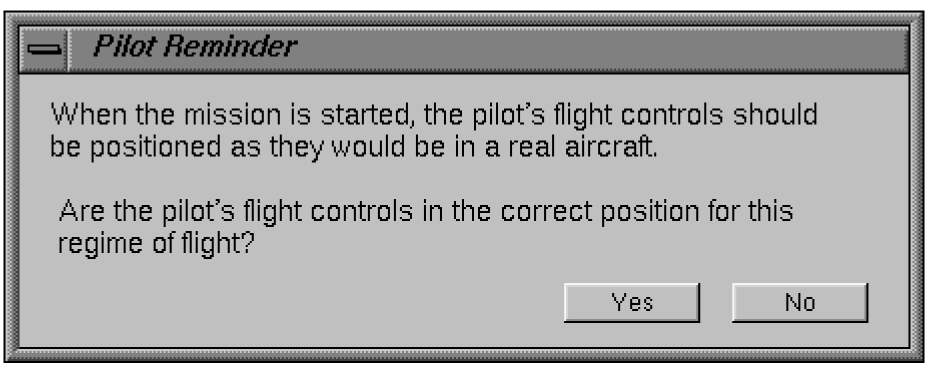


Figure 37 Pilot Reminder Window

4.3.3.7.3 Motion Platform Reminder Window

The Motion Platform Reminder window, shown in Figure 38, reminds the user of the simulator to operate the motion platform properly. The Yes button confirms that motion platform power is on with both amber and red lights, L1-MOTION POWER ON and L-2 MOTION POWER ON, located on the Electrical Power Control Panel. The No button does not confirm the action and closes the Motion Platform Reminder window.

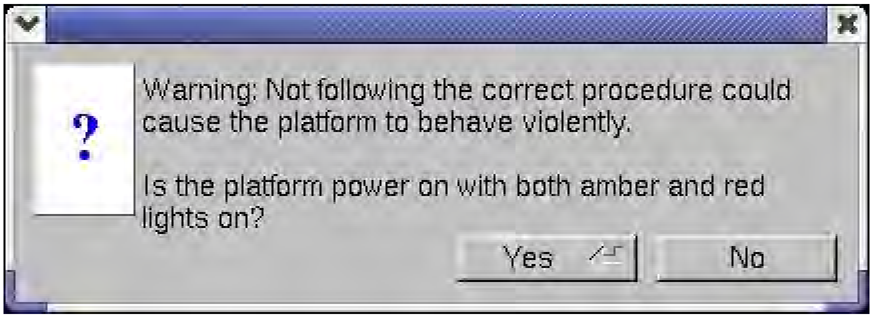


Figure 38 Motion Platform Reminder Window

4.4 Simulator Diagnostic Tools

The simulator provides the following four tools for diagnostic testing:

- Platform Test Window
- CerealBox Helo Setup GUI Window
- CerealBox Generic Data GUI Window
- Tracker GUI Window.

4.4.1 Manual Initiated Platform Test Window

The Platform Test window, as shown in Figure 39, allows the maintainer to test the motion platform device for proper movements. The Platform Test window is started by entering platform_test at the Simulation Computer display terminal. The window provides the following functions as described in Table 45.

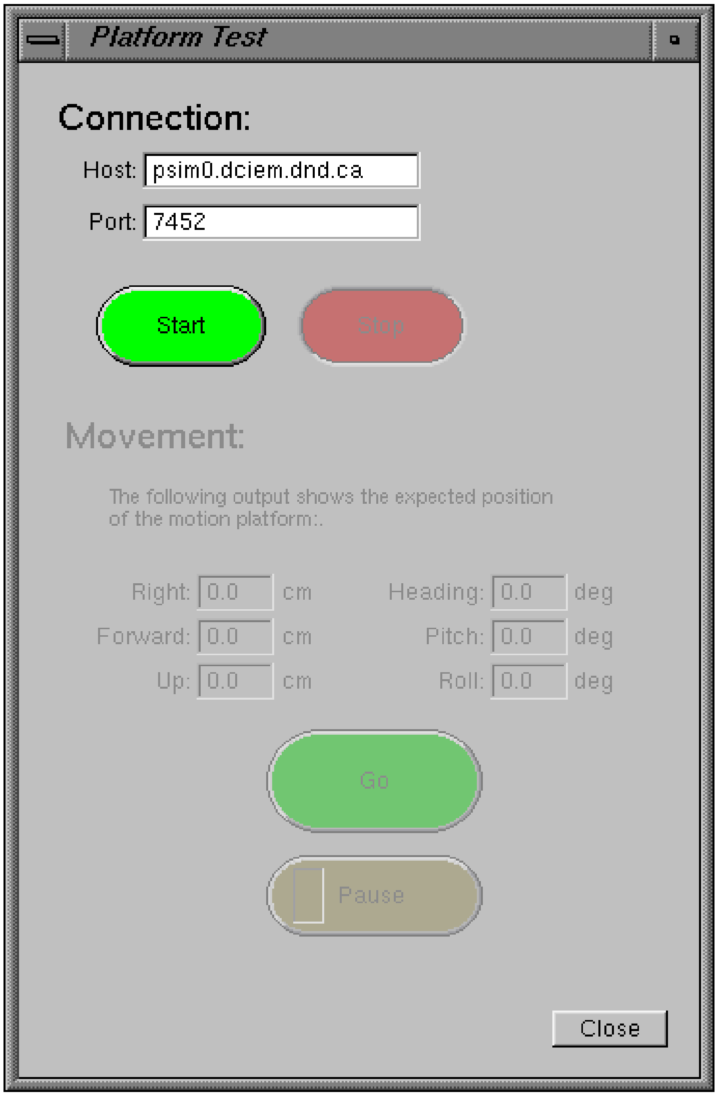


Figure 39 Platform Test Window

Table 45 Selection of Motion Platform Testing Functions

Entry	Definition
Motion Platform Control Computer Connection Statuses	
Host	Used to enter and display the Motion Platform

Entry	Definition
	Control Computer host name.
Port	Used to enter and display the Motion Platform Control Computer port number.
Motion Platform Movement Indicators	
Right	Used to define the amplitude value in the right direction. The default value is 0 cm.
Forward	Used to define the amplitude value in the forward direction. The default value is 0 cm.
Up	Used to define the amplitude value in the up direction. The default value is 0 cm.
Heading	Used to define the platform heading angle. The default angle is 0 degrees.
Pitch	Used to define the platform pitch angle. The default angle is 0 degrees.
Roll	Used to define the platform roll angle. The default angle is 0 degrees.
Motion Platform Testing Control Commands	
Start	Used to start the motion platform subsystem testing process.
Stop	Used to stop the motion platform subsystem testing process.

Entry	Definition
Go	Used to initiate or resume the platform test pattern. To initiate the platform test pattern, the user must select the Start button and then the Go button. It will take several minutes to complete the platform test. The platform test pattern movements are 5 inches in the forward position, 5 inches in the backward position, 5 inches in the left position, 4.5 inches in the up position, 4.5 inches in the down position, 18 degrees in the right yaw direction, 18 degrees in the left yaw direction, 18 degrees in the right roll direction, 18 degrees in the left roll direction, 18 degrees in the pitch forward direction, and 18 degrees in the pitch backward direction.
Pause	Used to pause the platform testing process.
Window Action Control	
Close	Used to close the Platform Test window.

The following steps are used to test the motion platform:

- On the Platform Test window, click the Start button to initiate the platform test.
- Click the Go button to start the platform test.
- Verify the platform pre-defined movements (see the Go button description).
- Click the Pause button to stop the platform movements.
- Click the Go button to resume the platform movement.
- Verify the platform pre-defined movements.
- Click the Pause button to stop the platform movements.
- Click the Stop button to terminate the platform test.
- Click the Close button to close the Platform Test window.

4.4.2 Manual Initiated CerealBox Helo Setup GUI Window

The CerealBox Helo Setup GUI Window, as shown in Figure 40, allows the maintainer to set and test the performance of the tail rotor pedals, collective pitch lever, cyclic pitch stick, and cyclic trim settings. An additional person is required to assist the maintainer to perform the CerealBox tests. The CerealBox GUI (Helo Setup) window is started by entering cerealbox_test at the Simulation Computer display terminal. Table 46 provides a summary of the user selections to test the following:

- Test the left and right tail rotor pedals movements
- Test the collective pitch lever movements
- Test the cyclic pitch stick movements
- Test the helicopter trim release, weapon, Auto Stab, ICS, Radio and Probe controls of the cyclic pitch stick buttons.

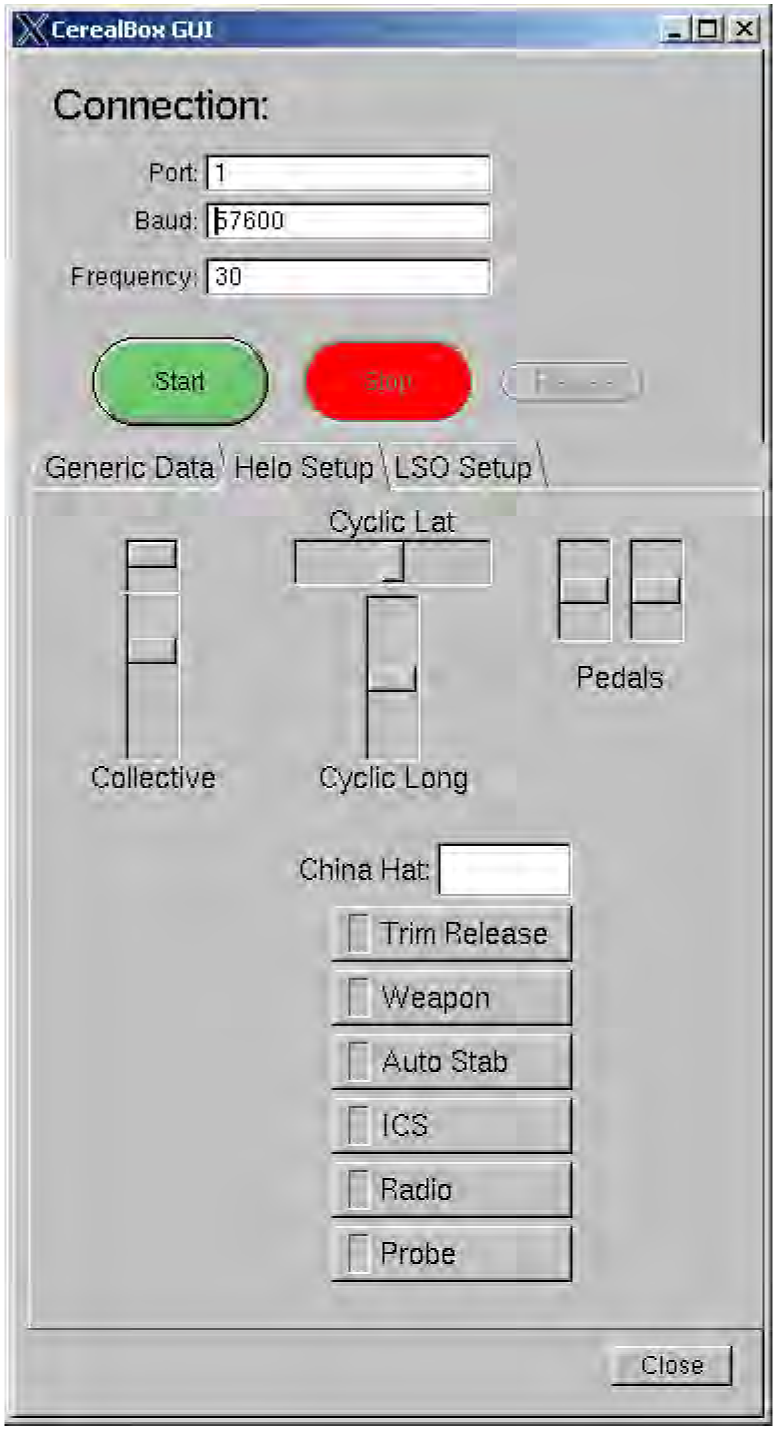


Figure 40 CerealBox Helo Setup GUI Window

Table 46 Selections of CerealBox Helo Set Up Testing Functions

Entry	Definition
CerealBox Connection Statuses	
Port	Used to enter and display the PC host port number
Baud	Used to enter and display the PC host serial port speed value.
Frequency	Used to enter the update frequency in Hz of the CerealBox device. The default value is 30 times per second.
CerealBox Testing Control Commands	
Start	Used to start the CerealBox device testing process. The user must move each control in each of its ranges of movement and activate all buttons on the cyclic pitch stick, then verify the results displayed at the CerealBox GUI window.
Stop	Used to stop the CerealBox device testing process.
Pause	Used to toggle the CerealBox device testing process to a pause state. The reselection of this button resumes the testing process.
Flight Control Display Indicators	
Collective	Used to test the collective pitch lever movements. The user must physically move the Collective Pitch Lever in the up or down direction and observe the movement displayed at the CerealBox GUI window.

Entry	Definition
Cyclic Lat	Used to set the cyclic pitch stick lateral movements. The user must physically move the Cyclic Pitch Stick in the lateral directions and observe the movement displayed at the CerealBox GUI window.
Cyclic Long	Used to set the cyclic pitch stick longitudinal movements. The user must physically move the Cyclic Pitch Stick in the longitudinal directions and observe the movement displayed at the CerealBox GUI window.
Pedals	Used to set the left and right pedal movements. The user must physically move the left or right tail rotor pedals in the forward or backward direction and observe the movement displayed at the CerealBox GUI window.
China Hat	Used to display the cyclic trim position. The valid positions are up, down, left, and right and they are mutually exclusive. The user must physically activate the trim buttons and observe the appropriate selection displayed at the CerealBox GUI window.
Flight Control Statuses	
Trim Release	Used to permit momentary release of the stick position for repositioning. The user must physically activate the Trim Release button and observe the selection displayed at the CerealBox GUI window.
Weapon	Used to select release of selected stores. The user must physically activate the Weapon button and observe the selection displayed at the CerealBox GUI window.
Auto Stab	Used to disengage the Automatic Stabilization Equipment. The user must physically activate the Auto Stab button and observe the selection

Entry	Definition
	displayed at the CerealBox GUI window.
ICS	Used to enable the Inter-Communication System for crew communication. The user must physically activate the ICS button and observe the selection displayed at the CerealBox GUI window.
Radio	Used to enable radio transmissions outside of the helicopter. The user must physically activate the Radio button and observe the selection displayed at the CerealBox GUI window.
Probe	Used to select release of the probe. The user must physically activate the Probe button and observe the selection displayed at the CerealBox GUI window.
Window Action Control	
Close	Used to close the CerealBox GUI window.

The following steps are used to test the CerealBox interfaces:

- On the CerealBox Helo Setup GUI window, click the Start button to initiate the CerealBox Interface test.
- Move the Collective Pitch Stick and observe the collective display value.
- Move the Cyclic Pitch Stick in the lateral direction and observe the Cyclic Lat display value.
- Move the Cyclic Pitch Stick in the longitudinal direction and observe the Cyclic Long display value.
- Move the left tail rotor pedal and observe the left pedal display value.
- Move the right tail rotor pedal and observe the right pedal display value.
- Move the Trim movement button and observe the China Hat display value.
- Depress the Trim Release button and observe the Trim Release button display value.
- Depress the Weapon button and observe the Weapon button display value.

- Depress the Auto Stab button and observe the Auto Stab button display value.
- Depress the ICS button and observe the ICS button display value.
- Depress the Radio button and observe the Radio button display value.
- Depress the Probe button and observe the Probe button display value.
- Click the Stop button to terminate the CerealBox Interface test.
- Click the Close button to close the CerealBox Helo Setup GUI window.

4.4.3 Manual Initiated CerealBox Generic Data GUI Window

The CerealBox Generic Data GUI window, as shown in Figure 41, allows the advanced user to set and test the general analogue and digital data for the CerealBox device. An additional person is required to assist the maintainer to perform the CerealBox tests. The CerealBox GUI window is started by entering cerealbox_test at the Simulation Computer display terminal. The window provides the following selections as described in Table 47.

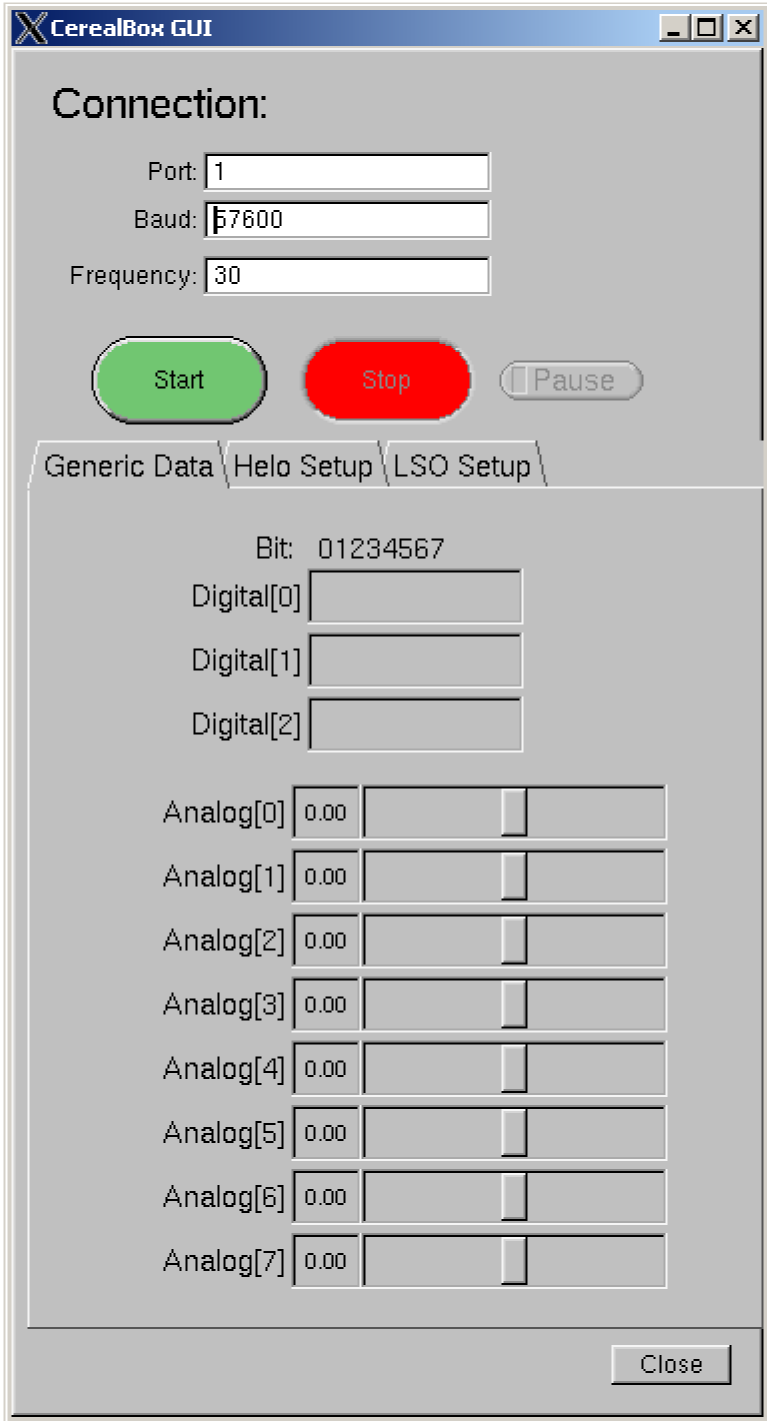


Figure 41 CerealBox Generic Data GUI Window

Table 47 Selections of CerealBox Generic Data Testing Functions

Entry	Definition
CerealBox Connection Statuses	
Port	Used to enter and display the PC host port number
Baud	Used to enter and display the PC host serial port speed value.
Frequency	Used to enter the update frequency in Hz of the CerealBox device. The default value is 30 times per second.
CerealBox Testing Control Commands	
Start	Used to start the CerealBox device testing process.
Stop	Used to stop the CerealBox device testing process.
Pause	Used to toggle the CerealBox device testing process to a pause state. The reselection of this button resumes the testing process.
CerealBox Digital Display Indicators	
Digital [0]	The Digital [0] field displays the Cyclic Pitch Stick discrete values. Bit 0 = Weapon, Bit 1 = Hat Up, Bit 2 = Hat Right, Bit 3 = Hat Left, Bit 4 = Hat Down, Bit 5 = Trim Release, Bit 6 = Probe, and Bit 7 = Auto Stab. The user must physically activate the trim buttons and observe the appropriate selection displayed at the CerealBox GUI window.
Digital [1]	The Digital [1] field displays the Cyclic Pitch Stick discrete values. Bit 0 = Radio and Bit 1 = ICS. The user must physically activate the Radio and/or ICS buttons and observe the appropriate selection displayed at the CerealBox GUI window.
Digital [2]	Not used.
CerealBox Analogue Display Indicators	

Entry	Definition
Analog [0]	Not used.
Analog [1]	Not used.
Analog [2]	Not used.
Analog [3]	Not used.
Analog [4]	The Analog [4] field displays the Cyclic Pitch Stick lateral position. The user must physically move the Cyclic Pitch Stick in the lateral directions and observe the movement displayed at the CerealBox GUI window.
Analog [5]	The Analog [5] field displays the Cyclic Pitch Stick longitudinal position. The user must physically move the Cyclic Pitch Stick in the longitudinal directions and observe the movement displayed at the CerealBox GUI window.
Analog [6]	The Analog [6] field displays the Tail Rotor Pedal position. The user must physically move the left or right tail rotor pedals in the forward or backward directions and observe the movement displayed at the CerealBox GUI window.
Analog [7]	The Analog [7] field displays the Collective Pitch Lever position. The user must physically move the Collective Pitch Lever in the up or down directions and observe the movement displayed at the CerealBox GUI window.
Window Action Control	
Close	Used to close the CerealBox GUI window.

The following steps are used to test the CerealBox interfaces:

- On the CerealBox Generic Data GUI window, click the Start button to initiate the CerealBox Interface test.
- Move the Collective Pitch Stick and observe the Analog [7] display value.

- Move the Cyclic Pitch Stick in the lateral direction and observe the Analog [4] display value.
- Move the Cyclic Pitch Stick in the longitudinal direction and observe the Analog [5] display value.
- Move the left tail rotor pedal and observe the Analog [6] display value.
- Move the right tail rotor pedal and observe the Analog [6] display value.
- Move the Trim movement button and observe the Digital [0] display value.
- Depress the Trim Release button and observe the Digital [0] display value.
- Depress the Weapon button and observe the Digital [0] display value.
- Depress the Auto Stab button and observe the Digital [0] display value.
- Depress the ICS button and observe the Digital [1] display value.
- Depress the Radio button and observe the Digital [1] display value.
- Depress the Probe button and observe the Digital [0] display value.
- Click the Stop button to terminate the CerealBox Interface test.
- Click the Close button to close the CerealBox Generic Data GUI window.

4.4.4 Manual Initiated CerealBox LSO Setup GUI Window

The CerealBox GUI has been updated to add an LSO Setup tab.

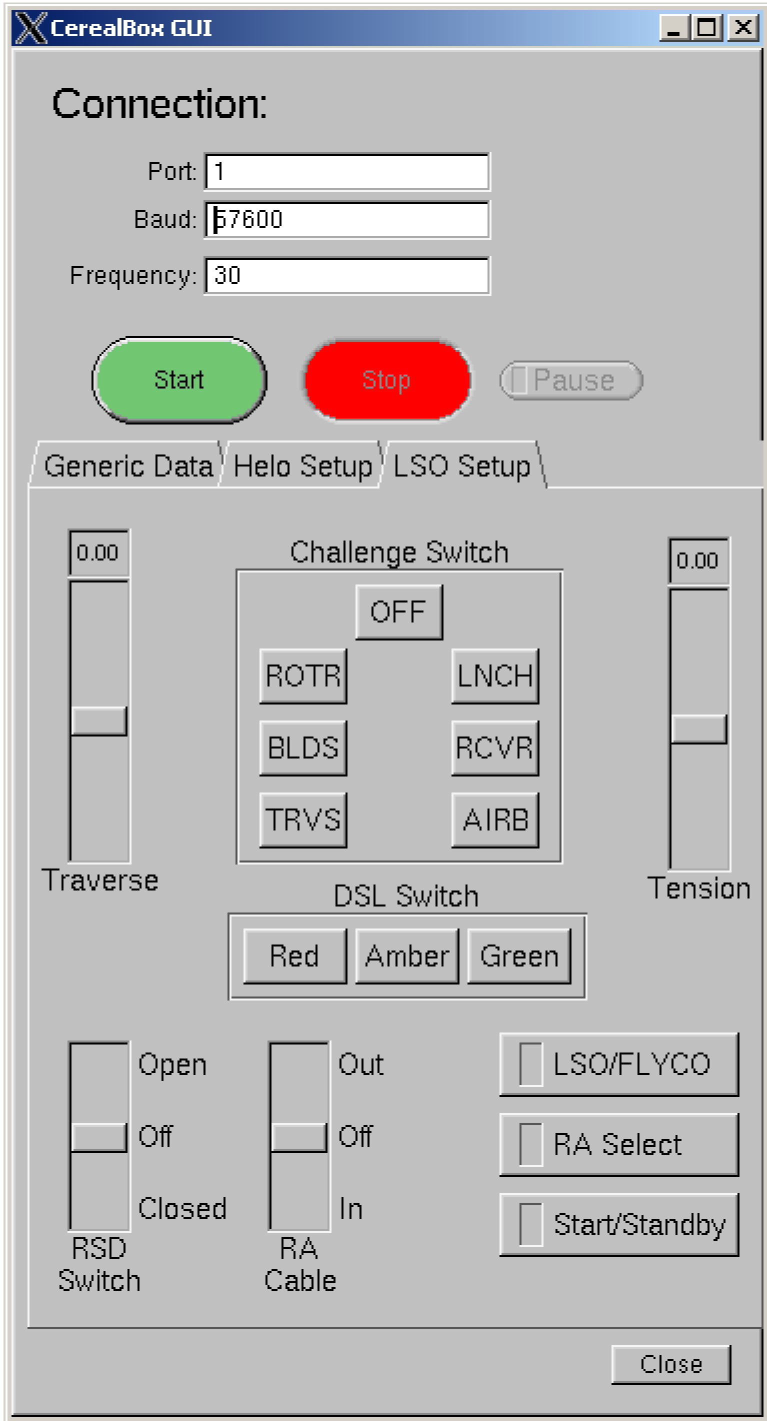


Figure 42 LSO Cerealbox Setup

4.4.5 Manual Initiated Tracker GUI Window

The Tracker GUI window, as shown in Figure 43, allows the maintainer to set, connect and control the head tracker device for testing. An additional user is required to assist the maintainer to conduct the tracker test. The Tracker GUI window is started by entering tracker_test at the Simulation Computer display terminal. The window provides the selections as described in Table 48.

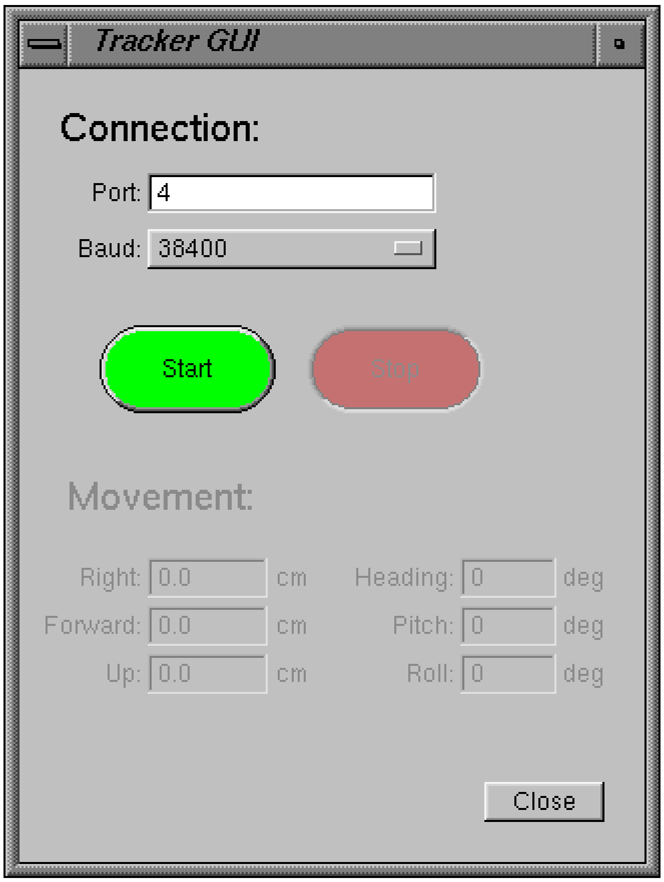


Figure 43 Tracker GUI Window

Table 48 Selections of Head Tracker Device Testing Functions

Entry	Definition

Entry	Definition
Tracker Connection Statuses	
Port	Used to display and enter the PC host port number
Baud	Used to display and enter the PC host serial port speed value in baud rate.
Tracker Testing Control Commands	
Start	Used to start the head tracker device testing process. The user must physically move the HMD and observe the movement result displayed at the Tracker GUI window.
Stop	Used to stop the head tracker device testing process.
Tracker Movement Indicators	
Right	Used to display the right offset value in centimeters. The user must physically move the HMD in the right direction and verify the displayed right value. Small fluctuations in the displayed value may be observed.
Forward	Used to display the forward offset value in centimeters. The user must physically move the HMD in the forward direction and verify the displayed forward value. Small fluctuations in the displayed value may be observed.
Up	Used to display the up offset value in centimeters. The user must physically move the HMD in the up direction and verify the displayed up value. Small fluctuations in the displayed value may be observed.

Entry	Definition
Heading	Used to display the heading angle value in degrees. The user must physically move the HMD in the heading direction and verify the displayed angle. Small fluctuations in the displayed value may be observed.
Pitch	Used to display the pitch angle value in degrees. The user must physically move the HMD in the pitch direction and verify the displayed angle. Small fluctuations in the displayed value may be observed.
Roll	Used to display the roll angle value in degrees. The user must physically move the HMD in the roll direction and verify the displayed angle. Small fluctuations in the displayed value may be observed.
Window Action Control	
Close	Used to close the tracker GUI window.

The following steps are used to test the head tracker movements:

- On the Tracker GUI window, click the Start button to initiate the head tracker test.
- Move the head tracker in the Right direction and observe the display value.
- Move the head tracker in the Forward direction and observe the display value.
- Move the head tracker in the Up direction and observe the display value.
- Move the head tracker in the Heading direction and observe the display value.
- Move the head tracker in the Pitch direction and observe the display value.
- Move the head tracker in the Roll direction and observe the display value.
- Click the Stop button to terminate the head tracker test.
- Click the Close button to close the Tracker GUI window.

This page intentionally left blank.

5 Examples of Training Scenarios

Just as the original manual mode training scenarios were based upon the established operational sequence diagrams (OSD) derived from military operation manuals, the current advanced playback version of the simulation is based upon several (currently 8) established virtual lesson plans derived from the basic scenario capabilities of the manual mode. They have the following parameterization:

- OSD A: daytime, mild sea, approach and free deck landing
- OSD B: daytime, moderate sea, radial approach and hauldown
- OSD C: nighttime, moderate sea, hauldown
- OSD D: nighttime, moderate sea, freedeck landing
- OSD E: daytime, moderate sea, untethered take-off
- OSD F: nighttime, fog and high seas, untethered take-off
- OSD G: nighttime, moderat seas, untethered take-off
- OSD H: nighttime, mild sea, instrument flight conditions (IFC) approach

6 Examples of Manual Mode Training Scenarios

The following three training scenarios are provided as examples:

- Daytime Freedeck Launch
- Night Time Freedeck Recovery
- Daytime Hauldown.

6.1 Daytime Freedeck Launch Scenario

6.1.1 Description

The current meteorological report indicates no overcast with unlimited visibility. Barometric pressure is 30 inches Mercury (i.e., 30.00 millibars or 760 mm Hg). True wind is from 303 degrees at 17 knots. There are no wind gusts. The outside air temperature is 12 degrees Celsius.

A Canadian Patrol Frigate (CPF) is steaming on a course of 0 degrees at 5 knots on a clear day with sea state 5 conditions. The ship is pitching 3 degrees and rolling 10 degrees. The sea temperature is 9 degrees Celsius.

The helicopter is to be launched during daylight at 18:00 hours local time to conduct an anti-submarine warfare (ASW) mission. If it is not the first launch of the day, it is assumed that Flying Stations were sounded 10 minutes before the recovery of the helicop¬ter currently preparing for departure. The helicopter is located on the flight deck and the rapid securing device (RSD) is closed.

All personnel are closed up at Flying Stations. The 2 minute ready-to-launch warning at approximately 17:50 hours local time has been given. Consequential activities of disconnecting the communication cable, setting the deck status lights (DSL) to amber, and communicating flying data have been performed. The deck status lights are also known as trafficator lights.

The Officer-of-the-Watch (OOW) passes flying courses, relative wind, and altimeter setting. After launch information is exchanged and clearance to launch is received, the tail probe is raised in preparation for launch. Airspace abaft the beam is checked and the RSD is opened during a steady period in deck motion. Clearance for take-off is given and the helicopter takes off.

6.1.2 Implemented Scenario

The implemented scenario is as follows:

- The Landing Signals Officer (LSO) requests launch by setting the activate launch light to amber and possibly mak¬ing a verbal request to the OOW.
- After launch information is exchanged (including updates to flying course, true wind, relative wind, and altimeter) and clearance to launch is received, the tail probe is raised in preparation for launch.
- Airspace abaft the beam (anywhere in a direction perpendicular to the ship gunwale) is checked. The DSL is set to green and the RSD is opened during a steady period in deck motion.
- Clearance for take-off is given and the helicopter takes off.
- The DSL is reset to amber.

6.1.3 Daytime Launch Scenario Prerequisite Conditions

The prerequisite conditions for the Daytime Launch scenario are as follows:

- Sounding of flight stations 30 minutes before flight time at 18:00 hours local time. If this is not the first flight, then stations are sounded 10 minutes before recovery in preparation for the next flight. Deck side nets are lowered.
- For the first flight of the day, the next six steps are applicable.
- Traversal of helicopter to launch position while LSO and Bridge perform system checks.
- The RSD safety bar is removed.
- Helicopter engine number 1 is started.
- Once hydraulic systems have been activated, the blades and tail pylon are spread.
- Helicopter aircraft checks are performed.
- Helicopter engine number 2 is started.
- The ship Maneuvers to final launch orientation.
- The 2-minute ready-to-launch warning is given at 17:58 hours local.

- For the first launch of the day, the communication cord linking the helicopter’s internal com¬munication system (ICS) to the ship’s internal communication system (i.e., SHINCOM cable connection) is unplugged.
- Quickly thereafter, the DSL is set to amber.
- Simultaneously, data (including flying course, true wind, relative wind, and altimeter) are passed to the LSO.
- Quickly thereafter, the same data is relayed from the LSO to the helicopter.

6.1.4 Procedures For Daytime Freedeck Launch Scenario

The training procedures for the Daytime Launch scenario are described in Table 49.

Table 49 Procedures for Daytime Freedeck Launch Training Scenario

No.	Steps	Response
1	The Instructor ensures that all the simulator subsystems are working properly.	
2	The Instructor checks that the pilot has completed the pre-test steps, including emergency power-off procedures, and is sitting in the pilot’s seat with the safety harness strapped on.	
3	At the IOS display monitor, double-click on the “HelMET” icon to display the HelMET Training Window. Select “Manual Flight Mode (Cockpit)”	
4	At the IOS display monitor, Select “Pilot and IOS”	The “HelMET IOS” and the HelMET Pilot Control” windows are displayed on the IOS display monitor. An example of the “HelMET IOS” window is shown in Figure 6. An example of the “HelMET Pilot Control” window is shown in Figure 27.
5	On the “HelMET IOS” window, click on the “Initiate Session” icon.	The “Select a Mission Plan” window is displayed on top of the “HelMET IOS” window. An example of the “Select a

No.	Steps	Response
		Mission Plan" window is shown in Figure 21.
6	On the "Select a Mission Plan" window, select the "DayLaunch.mpn" mission plan for the predefined Daytime Launch scenario.	The mission plan filename "Launch.mpn" is appended to the complete file path where the predefined Daytime Launch mission plan will be loaded.
7	On the "Select a Mission Plan" window, click on the OK button.	The "Select a Mission Plan" window is closed and a "System Busy" window is displayed. An example of the "System Busy" window is shown in Figure 23.
8		After a few minutes, the "System Busy" window is closed.
9		At the bottom of the "HelMET IOS" window, the "Initiate Session", "Join Session", "Debrief Missions" and "Exit" icons are replaced by "Select Roles", "Start Session" and "End Session" icons.
10	At the "HelMET IOS" window, verify that the information for the specified mission plan is correct: Mission Plan: Name: Launch Type: Deck Landing Procedures Details:	

No.	Steps	Response
	Local Time: 18:00 Visibility: Unlimited Helo Position: On Deck Deck Motion: Custom Motion Lighting: Day Altimeter (in hg): 29.00 Air Temperature (ºC): 12 Ship: Heading: 0 deg Speed: 5.0 kts Wind: Heading: 303 deg Speed: 17 kts Primary Wave: Heading: 303 deg Height: 4.0 ft Period: 5.0 s	

No.	Steps	Response
11	At the IOS display monitor, double-click on the “VR_Sim_Pilot” icon to start “HelMET Pilot Control” window	The “HelMET Pilot Control” window is displayed on the IOS display monitor. An example of the “HelMET Pilot Control” window is shown in Figure 27.
12	On the “HelMET Pilot Control” window, select the Video from the Settings pull-down menu.	The “Video Settings” window is displayed on the IOS display monitor. An example of the “Video Settings” window is shown in Figure 11.
13	On the “Video Settings” window, click the “VR Goggle” button and then click the “Close” button.	
14	At the NVisor SX60 Front Control Box, turn on the power supply to the NVisor SX60 HMD by activating the power on/off button.	
15	On the “HelMET Pilot Control” window, click the “Join Session” icon.	Two successive “System Busy” windows are displayed for a few minutes. An example of the “System Busy” window is shown in Figure 36.
16	On the “HelMET IOS” window, assume any unassumed roles, then click the “Start Session” icon.	At the “Participants” window, an “Initializing Mission” status message appears next to the IOS. An example of the “Init Mission” window is shown in Figure 14.
17		The “System Busy” window is displayed for a few minutes.
18	After the “System Busy” window is closed, check the device indicators for changes at the “HelMET Pilot Control” window.	
19	The Instructor requests the Pilot to put on the HMD with the headset and microphone.	
20	The Instructor puts on the headset and microphone.	

No.	Steps	Response
21	The Instructor verifies the operation of the headset and microphone with the Pilot.	
22	On the “HelMET Pilot Control” window, click on the “Fwd/Aft”, “Up/Down”, “Heading” and “Left/Right” buttons to adjust the Pilot eyepoint control for viewing.	The pilot’s view displayed on the repeater display monitor should have moved accordingly.
23	Release the Stop button located at the Instructor Operator Station.	The electrical power is applied to the Motion Platform Subsystem EMS motor drives.
24	On the “HelMET Pilot Control” window, click on the Platform Control “Start” button to enable power to the Motion Platform Subsystem.	The “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window is displayed.
25	On the “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window, click on the “Yes” button.	After the “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window is closed, the green Platform indicator is displayed at the “HelMET Pilot Control” window.
26	On the “HelMET Pilot Control” window, click on the “Ready” button.	A “Pilot Reminder” window is displayed. An example of the “Pilot Reminder” window is shown in Figure 37.
27	On the “Pilot Reminder” window, click the “Yes” button.	The “Pilot Reminder” window is closed.
28		At the “HelMET Pilot Control” window, the Participant status message (Pilot Control Ready for Mission) is displayed.

No.	Steps	Response
29		At the “HelMET IOS” window, the Participant status message (Pilot Control Ready for Mission) is displayed.
30	On the “HelMET IOS” window, click on the “Ready” button.	The green Ready button indicator is displayed and the “Start Mission” button is available.
31		At the “Ship Control” window, no trafficator light button is selected.
32		At the “Cable Tension Control” window, the Cable Tension value of 0 lbs is displayed.
33		At the “Trafficator Lights” window, the Red, Green and Off trafficator lights are not selected.
34		At the “Trafficator Lights” window, the amber trafficator light is displayed.
35		At the “Hauldown Control” window, the amber Tail Probe Down indicator is displayed.
36		At the “Hauldown Control” window, the green Main Probe Down indicator is displayed.
37		At the “Hauldown Control” window, the green Messenger Separated indicator is selected.
38		At the “Hauldown Control” window, the Landing Gear Down icon is displayed.

No.	Steps	Response
39		At the “Trap Control” window, the RSD trap is closed.
40		At the “Trap Control” window, the green Helo Trapped indicator is displayed.
41		At the “Helo Status” window, the Winch indicator is displayed with the OFF value.
42		At the “Helo Status” window, the green Main Probe Down indicator is displayed.
43		At the “Helo Status” window, the green Trapped indicator is displayed.
44		At the “Helo Status” window, the green Tail Probe Down indicator is displayed.
45		At the “Ship Status” window, check the ship heading and speed, true wind direction and speed, relative wind direction and speed, and altimeter for correctness.
46		At the “Situation Awareness” window, the RSD trap is closed and the red flag is in the up position.
47		At the “Situation Awareness” window, the green YES and amber LNCH buttons are displayed.
48		At the “Situation Awareness” window, the amber trafficator light is displayed.
49		At the “Situation Awareness” window, the Cable Tension value of 0 lbs is

No.	Steps	Response
		displayed.
50	On the “HelMET IOS” window, click on the “Start Mission” button.	The green mission status indicator is displayed to indicate that the mission has started. An example of the HelMET IOS running window is shown in Figure 16.
51	The Pilot calls: “Ready takeoff, ASE tail probe, # (single engine speed)”.	
52	The Instructor calls: “Roger”.	
53	The Instructor confirms that it is ready for launch.	
54	The Instructor ensures that the airspace forward of the beam is clear.	
55	The Instructor ensures that ‘YES’ is for launch request.	
56	The Instructor calls: “(flying course), (true wind), (relative wind), and (altimeter setting)”.	
57	The Pilot calls: “Roger”	
58	The Instructor ensures that the port side flight deck and air space are clear and that the safety bar is removed.	
59	The Instructor ensures that the main probe tip will clear the RSD.	
60	The Instructor calls: “Up tail probe”.	
61	On the “Hauldown Control” window, click on the Tail Probe Up button.	At the “Helo Status” window, the amber Tail Probe Down indicator is off and the green Tail Probe Up indicator is displayed.

No.	Steps	Response
62	The Instructor calls: “Tail probe is up”.	
63	The Instructor checks that the port side airspace abaft the beam is clear and that the port side of flight deck is clear.	
64	The Instructor ensures that the starboard airspace abaft the beam is clear.	
65	The Instructor evaluates the flight deck motion for steady period.	
66	If the flight deck is not steady, the Instructor calls: “Standby, awaiting the deck”.	
67	On the “Trap Control” window, click on the RSD trap.	At the “Situation Awareness” window, check the RSD red flag is in the down position.
68	The Instructor checks that the port arrester beam is opened.	
69	The Instructor checks that the arrester beam is opened.	
70	The Instructor ensures that the main probe tip will clear the RSD.	
71	On the “Trafficator Lights” window, click on the green trafficator light button.	At the “Situation Awareness” window, the green trafficator light is displayed.
72	The Instructor calls: “Clear take off”.	
73	The Pilot controls the helicopter to take-off.	
74	The Instructor observes that the helicopter has taken off.	

No.	Steps	Response
75	The Pilot controls the helicopter to maintain it in a hover position.	
76	If the helicopter has departed, skip the next six steps. If the helicopter has not taken off, select the amber trafficator light.	At the "Situation Awareness" window, the amber trafficator light is displayed.
77	If the helicopter has not taken off, the Instructor reports status. The helicopter is trapped and the trapped status is reported.	
78	The Instructor calls: "All clear".	
79	The Instructor (NFC) checks the flight instruments for aircraft positioning.	
80	The Instructor (NFC) calls: "Clear Left" or "Clear Right"	
81	The Pilot departs from the hover position.	
82	The Instructor (FLYCO) observes that the helicopter has departed.	
83	The Instructor calls: "Bridge SAC LSO Helo is departing port side". "Break break". "SAC LSO When you have coms you have control".	
84	On the "HelMET IOS" window, click on the "Pause" button.	The yellow HelMET IOS Status and Pause button indicator are displayed. An example of the "HelMET IOS" Pause window is shown in Figure 16.
85	On the "HelMET IOS" window, click on the "Stop" button.	A "HelMET IOS" window with the Close button is displayed.
86	On the "HelMET Pilot Control" window, click on the Platform Control "Stop" button to remove power to the Motion Platform	The "System Busy" window is displayed for a few minutes.

No.	Steps	Response
	Subsystem EMS motors.	
87	Press the Stop button located at the Instructor Operator Station.	
88	At the NVisor SX60 Front Control Box, turn off the power supply by depressing the power on/off button.	
89	On the “HelMET Pilot Control” window, select the Video Settings from the Settings pull-down menu.	The “Video Settings” window is displayed on the IOS display monitor.
90	On the “Video Settings” window, click on the “Monitor” button.	The “If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?” dialog window is displayed on the IOS display monitor.
91	On the “If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?” dialog window and click on the “Yes” button.	The “If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?” dialog window is closed.
92	On the “Video Settings” window, click on the “Close” button.	The “Video Settings” window is closed.
93	On the “HelMET IOS” window, click on the “Close” button.	The “Save missions for later review?” dialog window is displayed. An example of the “Save missions for later review?” dialog window is shown in Figure 25.
94	On the “Save missions for later review?” dialog window, click on the “Yes” button.	The “Save missions for later review?” dialog window is closed.
95		The “Enter the name of the file to save the mission” window is displayed. An example of the “Enter the name of the

No.	Steps	Response
		file to save the mission" window is shown in Figure 26.
96	On the "Enter the name of the file to save the mission" window, enter a filename with extension (e.g. launch_1.log) and click on the "OK" button.	The "Enter the name of the file to save the mission" window is closed and the "HelMET IOS" window with an "End Session" icon is displayed. An example of the "HelMET IOS" window is shown in Figure 13.
97	On the "HelMET IOS" window, click on the "End Session" icon.	The "The master has closed the session" window is displayed. An example of the "The master has closed the session" window is shown in Figure 24.
98	On the "The master has closed the session" window, click on the "OK" button.	The "The master has closed the session" window is closed.
99	On the "HelMET IOS" window, click on the "Review Missions" icon.	The "HelMET IOS" window with a list of filenames is displayed.
100	On the "HelMET IOS" window, select the previously entered filename (e.g. launch_1.log) and click on the "OK" button.	
101	On the "HelMET IOS" window, select the LSO Model: EyePoint from the Available Viewpoints.	The LSO Model viewpoint is displayed on the "HelMET IOS" window. An example of LSO Model viewpoint on the "HelMET IOS" window is shown in Figure 20.
102	On the "HelMET IOS" window, select the double right arrow button to replay at a fast forward speed.	The LSO Model viewpoint is redisplayed at a fast forward speed.
103	On the "HelMET IOS" window, click on the "Close" button.	
104	On the "HelMET IOS" window, click on the "Exit" icon.	The "HelMET IOS" window is closed.

No.	Steps	Response
105	On the “HelMET Pilot Control” window, click on the “Exit” icon.	The “HelMET Pilot Control” window is closed.
106	The Instructor removes the headset and microphone.	
107	The Instructor requests the Pilot to close his eyes for a few seconds.	
108	After a few seconds, the Instructor requests the Pilot to remove the HMD.	
109	The Instructor places the HMD in a holder at the back of the pilot’s seat.	
110	The Instructor helps the Pilot to remove the safety harness.	
111	The Instructor helps the Pilot step down from the Motion Platform.	

6.2 Night Time Freedeck Recovery Scenario

6.2.1 Scenario Description

The current meteorological report indicates no overcast with unlimited visibility. The barometric pressure is 30 inches Mercury (i.e., 30.00 millibars or 760 mm Hg). The true wind is from 303 degrees at 17 knots. There are no wind gusts. The outside air temperature is 9 degrees Celsius.

A Canadian Patrol Frigate (CPF) is steaming on a course of 0 degrees at 5 knots on a clear night with sea state 5 conditions. The ship is pitching 3 degrees and rolling 10 degrees. The sea temperature is at 12 degrees Celsius.

The helicopter is on a course of 0 degrees. A visual flying rule (VFR) approach with an unrestricted mission control policy and recovery time of 20:00 hours local is expected.

All personnel are closed up at Flying Stations. At 19:50 hours local time, the LSO sets the ready recovery light to amber. Rendezvous instructions are passed and the helicopter is cleared to make an approach to the CPF. The helicopter has already passed through the 3 nautical mile checkpoint. The helicopter is conned to the final approach fix at 2 nautical miles aft of the ship. The helicopter's position is confirmed as it closes from 2 to 1 nautical mile astern of the ship.

Once the ship is visual, approach control is exchanged between the anti-submarine air controller (ASAC) and LSO. Clearance to make an approach is given and the helicopter transits to a hover on the portside of the ship. Next, the helicopter transits to a high hover over the RSD. Once a stable hover is established, the helicopter descends to a lower hover and maintains a low hover over the RSD. When the ready-to-land transmission is received, a steady period in deck motion is predicted and it is determined whether or not the main probe will enter the RSD capture area. The cautionary order "land now" is given and then the executive order "down, down, down" is given. The helicopter lands and is trapped in the RSD. Helicopter status and clear-to-manoeuvre are reported.

6.2.2 Implemented Scenario

The implemented scenario is as follows:

- Approach control is transferred from the SAC to the LSO.
- The helicopter is directly cleared for a freedeck landing or to proceed to a Delta Hover Astern position.
- If clearance to Delta Hover Astern has been given, the helicopter transits to the Delta Hover Astern position where clearance is obtained to proceed with Charlie Freedeck.
- The helicopter proceeds to a high hover on the portside of the ship.
- Next, the helicopter transits to a high hover over the RSD.
- Once a stable hover is established and when an appropriate steady period of ship motion is anticipated, the helicopter descends to the low hover posi¬tion asserting that it is ready to land.
- The LSO advises on helicopter position then gives the "land now" order.
- The helicopter drops into the trap and the arrester beams are closed.
- The helicopter tail probe is lowered.

6.2.3 Prerequisite Conditions

The prerequisite conditions for the Night Time Freedeck Recovery scenario are as follows:

- Sounding of flight stations 30 minutes before recovery time at 19:30 hours local.
- Deck side nets are lowered.
- The helicopter passes through the 3 nautical mile checkpoint.
- The LSO activates the recover light.
- OOW immediately responds NO.
- Data (including Charlie time, course, true wind, relative wind, and altime¬ter) are transmitted from the SAC to the helicopter.
- The SAC clears the helicopter for an approach.
- The helicopter co-pilot lowers the main probe and requests that the pilot put on the landing gear brakes. The pilot puts on the landing gear brakes.
- If requested by the LSO, FLYCO turns on the strobe lighting.
- The helicopter passes through the 2 nautical mile checkpoint.
- The helicopter is conned to the final approach fix (FAF). The ship is steered to final approach direction.
- OOW responds YES to recover light.
- FLYCO turns on centre lighting (CL) and horizontal reference system (HRS) lighting and sets deck status lights (DSL) to amber.
- The helicopter passes through the 1 nautical mile checkpoint.
- FLYCO turns on flight deck flood lights (FDFL), hangar face lighting (HFL), and hangar top lighting (HTL).
- Mutual visual contact is confirmed, at which time FLYCO turns off strobe light¬ing if it is already on.
- When non-flying crew (NFC) is close enough to estimate distances, the non-flying pilot (NFP) takes control while the flying pilot (FP) continues to watch the instruments. This case does not apply because a single helicopter pilot is in training.

6.2.4 Procedures For Night Time Freedeck Recovery Scenario

The training procedures for the Night Time Freedeck Recovery scenario are described in Table 50.

Table 50 Procedures for Night Time Freedeck Recovery Scenario

No.	Steps	Response
1	The Instructor checks that all the simulator subsystems are working properly.	
2	The Instructor checks that the Pilot has completed the pre-test steps, including emergency power off procedures, and is sitting in the pilot’s seat with the safety harness strapped on.	
3	At the IOS display monitor, double-click on the “HelMET” icon to display the HelMET Training Window. Select “Manual Flight Mode (Cockpit)”	
4	At the IOS display monitor, Select “Pilot and IOS”	The “HelMET IOS” and the HelMET Pilot Control” windows are displayed on the IOS display monitor. An example of the “HelMET IOS” window is shown in Figure 6. An example of the “HelMET Pilot Control” window is shown in Figure 27.
5	On the “HelMET IOS” window, click on the “Initiate Session” icon.	A “Select a Mission Plan” window is displayed on top of the “HelMET IOS” window. An example of the “Select a Mission Plan” window is shown in Figure 21.
6	On the “Select a Mission Plan” window, select the “NigntFreedeckLanding.mpn” mission plan for the predefined Freedeck Recovery scenario.	The mission plan filename “NightFreedeckLanding.mpn” is appended to the complete file path where the predefined Freedeck Recovery mission plan will be loaded.
7	On the “Select a Mission Plan” window, click on the OK button.	The “Select a Mission Plan” window is closed and a “System Busy” window is displayed. An example of the “System Busy” window is shown in Figure 23.

No.	Steps	Response
8		After a few minutes, the “System Busy” window is closed.
9		At the bottom of the “HelMET IOS” window, the “Initiate Session”, “Join Session”, “Debrief Missions” and “Exit” icons are replaced by “Select Roles”, “Start Session” and “End Session” icons.
10	At the “HelMET IOS” window, verify that the information for the specified mission plan is correct: Mission Plan Name: Freedeck Type: Deck Landing Procedures Details: Local Time: 20:0 Visibility: Unlimited Helo Position: Delta Hover Deck Motion: Custom Motion Lighting: Full Moon Altimeter (in hg): 29.00 Air Temperature (ºC): 12 Ship: Heading: 0 deg Speed: 5.0 kts	

No.	Steps	Response
	Wind: Heading: 303 deg Speed: 17 kts Primary Wave: Heading: 303 deg Height: 5.0 ft Period: 5.0 s	
12	On the “HelMET Pilot Control” window, select the Video from the Settings pull-down menu.	The “Video Settings” window is displayed on the IOS display monitor. An example of the “Video Settings” window is shown in Figure 11.
13	On the “Video Settings” window, click on the “VR Goggle” button and then click on the “Close” button.	
14	At the NVisor SX60 Front Control Box, turn on the power supply to the NVisor SX60 HMD by activating the power on/off button.	
15	On the “HelMET Pilot Control” window, click on the “Join Session” icon.	Two successive “System Busy” windows are displayed for a few minutes. An example of the “System Busy” window is shown in Figure 36.
16	On the “HelMET IOS” window, click on the “Start Session” icon.	At the “Participants” window, an “Initializing Mission” status message appears next to the IOS. An example of the “Init Mission” window is shown in Figure 14.
17		A “System Busy” window is displayed for a few minutes.

No.	Steps	Response
18	After the “System Busy” window is closed, check the device indicators for changes at the “HelMET Pilot Control” window.	
19	The Instructor requests the Pilot to put on the HMD with the headset and microphone.	
20	The Instructor puts on the headset and microphone.	
21	The Instructor verifies the operation of the headset and microphone with the Pilot.	
22	On the “HelMET Pilot Control” window, click on the “Fwd/Aft”, “Up/Down”, “Heading” and “Left/Right” buttons to adjust the Pilot eyepoint control for viewing.	The pilot’s view displayed on the repeater display monitor should have moved accordingly.
23	Release the Stop button located at the Instructor Operator Station.	The electrical power is applied to the Motion Platform Subsystem EMS motor drives.
24	On the “HelMET Pilot Control” window, click on the Platform Control “Start”, button to enable power to the Motion Platform Subsystem.	The “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window is displayed.
25	On the “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window, click on the “Yes” button.	After the “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window is closed, the green Platform indicator is displayed at the “HelMET Pilot Control” window.
26	On the “HelMET Pilot Control” window, click on the “Ready”	The “Pilot Reminder” window is displayed. An example of the “Pilot Reminder” window is

No.	Steps	Response
	button.	shown in Figure 37.
27	On the “Pilot Reminder” window, click on the “Yes” button.	The “Pilot Reminder” window is closed.
28		At the “HelMET Pilot Control” window, the Participant status message (Pilot Control Ready for Missions) is displayed.
29		At the “HelMET IOS” window, the Participant status message (Pilot Control Ready for Mission) is displayed.
30	On the “HelMET IOS” window, click on the “Ready” button.	The green Ready button indicator is displayed. The “Start Mission” button is available.
31		At the “Ship Control” window, the 1 Mile lighting button is displayed.
32		At the “Cable Tension Control” window, the Cable Tension value of 0 lbs is displayed.
33		At the “Trafficator Lights” window, the Red, Green and Off trafficator lights are not selected.
34		At the “Trafficator Lights” window, the amber trafficator light is displayed.
35		At the “Hauldown Control” window, the Tail Probe Up indicator is displayed.
36		At the “Hauldown Control” window, the Main Probe Down indicator is displayed.
37		At the “Hauldown Control” window, the Messenger Separated indicator is displayed.
38		At the “Hauldown Control” window, the Landing Gear Up icon is displayed.

No.	Steps	Response
39		At the “Trap Control” window, the RSD trap is open.
40		At the “Trap Control” window, the Helo Trapped indicator is not displayed.
41		At the “Helo Status” window, the Winch indicator is displayed with the OFF value.
42		At the “Helo Status” window, the green Main Probe Down indicator is displayed.
43		At the “Helo Status” window, the Tail Probe Down indicator is not displayed.
44		At the “Helo Status” window, the green Trapped indicator is not displayed.
45		At the “Ship Status” window, check the ship heading and speed, true wind direction and speed, relative wind direction and speed, and altimeter for correctness.
46		At the “Situation Awareness” window, the RSD trap is open and the red flag is in the down position.
47		At the “Situation Awareness” window, the green YES and amber RCVR buttons are displayed.
48		At the “Situation Awareness” window, the amber trafficator light is displayed.
49		At the “Situation Awareness” window, the Cable Tension value of 0 lbs is displayed.
50	On the “HelMET IOS” window, click on the “Start Mission” button.	The green mission status indicator is displayed to indicate that the mission has started. An example of the HelMET IOS running window is shown in

No.	Steps	Response
		Figure 16.
51	The Instructor calls: “Bird boat call paddles for control”.	
52	The Pilot calls: “Boat bird roger break break paddles bird calling for control”.	
53	The Instructor calls: “Bird paddles roger <pause> signal Charlie freedeck”.	
54	On the “Trafficator Lights” window, click on the green trafficator light.	At the “Situation Awareness” window, the green trafficator light is displayed.
55	The Pilot ensures that the green trafficator light is on.	
56	The Instructor monitors mission, helo status and initiates Wave_Off as required.	
57	The Instructor evaluates the ship deck motion at the “Ship Status” window.	
58	The Instructor monitors the relative wind speed and direction.	
59	The Instructor monitors the helicopter position.	
60	The Pilot controls the helicopter to hover port side.	
61	The Instructor is to monitor flight instruments for aircraft positioning.	

No.	Steps	Response
62	When the single engine speed is dropping below the safe limit, the Instructor (NFC) reports a “Safe single engine speed”.	
63	The Pilot controls the helicopter to high hover over the RSD.	
64	On the “Hauldown Control” window, click the Landing Gear Down button.	At the “Hauldown Control” window, the Landing Gear Down icon is displayed.
65	The Pilot ensures that the helicopter landing gear is down.	
66	The Instructor calls: “Two down and locked, bug light my side”.	
67	The Pilot calls: “Bug light my side”.	
68	The Instructor is to advise on the helicopter fore/aft position. The Instructor calls: “Steady”, “Back one”, “Ahead three”, or “Good position”.	
69	The Pilot controls the helicopter to arrive at hover over the RSD.	
70	On the “Trafficator Light” window, click on the amber trafficator light.	At the “Situation Awareness” window, the amber trafficator light is displayed.
71	The Pilot ensures that the amber trafficator light is on.	
72	The Instructor is to advise on the helicopter position. The Instructor calls: “Steady”, “Back one”,	

No.	Steps	Response
	"Ahead three", or "Good position".	
73	The Pilot is to maintain the helicopter in a stable hover position.	
74	The Pilot monitors the natural horizon, checks the horizontal reference bars, and evaluates the ship motion for steady period.	
75	The Pilot controls the helicopter to low hover over the RSD.	
76	The Pilot monitors the ship position relative to hangar line-up lines.	
77	The Instructor is to advise on the helicopter position by calling: "Steady", "Back one", "Ahead three", "Drifting", or "Good position".	
78	The Pilot maintains the helicopter in a stable hover position, monitors the helicopter fore/aft positions based on updates from the Instructor, and makes position adjustments.	
79	The Pilot controls the helicopter in a stable hover position.	
80	The Pilot calls: "Ready to land".	
81	If the Main Probe will not enter the RSD, the Instructor transmits position corrections by calling: "Left", "Right", "Ahead", "Back", "Up", "Down", or "Steady".	

No.	Steps	Response
82	If the ship motion is not steady, the Instructor awaits next steady period.	
83	The Instructor calls: “Land now, down down down”.	
84	On the “Trafficator Lights” window, click on the green trafficator light.	At the “Situation Awareness” window, the green trafficator light is displayed.
85	The Pilot lands the helicopter on the ship deck.	
86	The Instructor observes that the helicopter has landed on the ship.	
87	The Instructor observes that the Main Probe enters the RSD capture area.	
88	On the “Trap Control” window, click on the RSD trap.	At the “Trap Control” window, the RSD trap is closed.
89		At the “Situation Awareness” window, the RSD red flag is up.
90	The Instructor calls: “Bridge LSO Helo is trapped on deck. You are clear to manoeuvre”.	
91	On the “HelMET IOS” window, click on the “Pause” button.	The yellow HelMET IOS Status and Pause button indicator are displayed. An example of the HelMET IOS Pause window is shown in Figure 16.
92	On the “HelMET IOS” window, click on the “Stop” button.	A “HelMET IOS” window with the Close button is displayed.
93	On the “HelMET Pilot Control”	The “System Busy” window is displayed for a

No.	Steps	Response
	window, click on the Platform Control "Stop" button to remove power to the Motion Platform Subsystem EMS motors.	few minutes.
94	Press the Stop button located at the Instructor Operator Station.	
95	At the NVisor SX60 Front Control Box, turn off the power supply by depressing the power on/off button.	
96	On the "HelMET Pilot Control" window, select the Video Settings from the Settings pull-down menu.	The "Video Settings" window is displayed on the IOS display monitor.
97	On the "Video Settings" window, click on the "Monitor" button.	The "If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?" dialog window is displayed on the IOS display monitor.
98	On the "If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?" dialog window and click on the "Yes" button.	The "If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?" dialog window is closed.
99	On the "Video Settings" window, click on the "Close" button.	The "Video Settings" window is closed.
100	On the "HelMET IOS" window, click on the "Close" button.	The "Save missions for later review?" dialog window is displayed. An example of the "Save missions for later review?" dialog window is shown in Figure 25.
101	On the "Save missions for later review?" dialog window, click on the "Yes" button.	The "Save missions for later review?" dialog window is closed.

No.	Steps	Response
102		The “Enter the name of the file to save the mission” window is displayed. An example of the “Enter the name of the file to save the mission” window is shown in Figure 26.
103	On the “Enter the name of the file to save the mission” window, enter a filename with extension (e.g. freedeck_1.log) and click on the “OK” button.	The “Enter the name of the file to save the mission” window is closed and the “HelMET IOS” window with an “End Session” icon is displayed. An example of the HelMET IOS window is shown in Figure 13.
104	On the “HelMET IOS” window, click on the “End Session” icon.	The “The master has closed the session” window is displayed. An example of the “The master has closed the session” window is shown in Figure 24.
105	On the “The master has closed the session” window, click on the “OK” button.	The “The master has closed the session” window is closed.
106	On the “HelMET IOS” window, click on the “Review Missions” icon.	The “HelMET IOS” window with a list of filenames is displayed.
107	On the “HelMET IOS” window, select the previously entered filename (e.g. freedeck_1.log) and click on the “OK” button.	
108	On the “HelMET IOS” window, select the LSO Model: EyePoint from the Available Viewpoints.	The LSO Model viewpoint is displayed on the “HelMET IOS” window. An example of the LSO Model viewpoint on the “HelMET IOS” window is shown in Figure 20.
109	On the “HelMET IOS” window, select the double right arrow button to replay at a fast forward speed.	The LSO Model viewpoint is redisplayed at a fast forward speed.
110	On the “HelMET IOS” window, click on the “Close” button.	

No.	Steps	Response
111	On the “HelMET IOS” window, click on the “Exit” icon.	The “HelMET IOS” window is closed.
112	On the “HelMET Pilot Control” window, click on the “Exit” icon.	The “HelMET Pilot Control” window is closed.
113	The Instructor removes the headset and microphone.	
114	The Instructor requests the Pilot to close his eyes for a few seconds.	
115	After a few seconds, the Instructor requests the Pilot to remove the HMD.	
116	The Instructor places the HMD in a holder at the back of the pilot’s seat.	
117	The Instructor helps the Pilot to remove the safety harness.	
118	The Instructor helps the Pilot step down from the Motion Platform.	

6.3 Daytime Hauldown Recovery Scenario

6.3.1 Scenario Description

The meteorological report indicates no overcast with unlimited visibility. Barometric pressure is 30 inches Mercury (i.e., 30.00 millibars or 760 mm Hg). True wind is from 270 degrees at 30 knots. There are no wind gusts. The outside air temperature is 11 degrees Celsius.

A Canadian Patrol Frigate (CPF) is steaming on a course of 285 degrees at 10 knots on a clear day with sea state 6 conditions. The ship is pitching 3 degrees and rolling 15 degrees. The sea is running from 300 degrees with waves 4 to 6 feet in height. The swell is running from 240 degrees at 10 second intervals at a height of 10 feet. The sea temperature is 9 degrees Celsius.

The helicopter is on a course of 285 degrees 1 nautical mile aft of the CPF. It is to be recovered during daylight at 14:10 hours local via the Recovery Assist, Secure, and Traverse (RAST) system. A visual flight rules approach with an unrestricted mission control policy is in effect.

All personnel are closed up at Flying Stations. At 14:00 hours local time, the pilot reports that the CPF is visible. Control is transferred between the ASAC and LSO. The helicopter transits to a hover on the portside of the ship. After putting the landing gear brakes on, the helicopter flies to a hover starboard of the RSD and lowers the messenger cable. The deck crew retrieve the messenger cable and connect it with the hauldown cable. After receiving clearance, the deck crew return to their previous positions. The cables are raised into the helicopter and once seated and separated, a report is made to the LSO. The LSO engages hauldown mode on the RAST console and reports tension on.

The helicopter transits to a high hover over the RSD. Once a stable hover is established, the helicopter descends to a low hover over the RSD. When the ready-to-land message is received, a steady period in deck motion is predicted, and it is determined whether or not the main probe will enter the RSD capture area. The cautionary order “land now” is given and then the executive order “down, down, down” is given. The helicopter lands and is trapped in the RSD. The tail probe is lowered and its position reported. Helicopter status and clear-to-manoeuvre message are reported.

6.3.2 Implemented Scenario

The implemented scenario is as follows:

- Approach control is transferred from the ASAC to the LSO.
- The helicopter is directly cleared for a hauldown landing or to proceed to a Delta Hover Astern position.
- If clearance to Delta Hover Astern has been given, the helicopter transits to the Delta Hover Astern position whence clearance is obtained to proceed with Charlie Hauldown.
- The helicopter proceeds to a high hover on the portside of the ship.
- Next, the helicopter transits to a high hover starboard of the RSD and lowers the messenger cable.

- The deck crew grounds the cable and mates the messenger cable with the hauldown cable.
- The deck crew returns to their positions as the cable is raised.
- The cable is raised, seated, and separated.
- A report is made to the LSO.
- The LSO engages hauldown mode and reports tension on.
- The helicopter transits to a high hover over the RSD.
- Once a stable hover is established and when an appropriate steady period of ship motion is anticipated, the helicopter descends to the low hover posi¬tion asserting that it is ready to land.
- The LSO advises on helicopter position then gives the “land now” order at which time maximum requested tension is applied.

6.3.3 Prerequisite Conditions

The prerequisite conditions for the Daytime Hauldown Recovery scenario are as follows:

- Sounding of flight stations 30 minutes before recovery time at 14:10 hours local. Deck side nets are lowered.
- The helicopter passes through the 3 nautical mile checkpoint.
- The LSO activates the recover light.
- OOW immediately responds NO.
- Data (including Charlie time, course, true wind, relative wind, and altime¬ter) are transmitted from the SAC to the helicopter.
- The need for a hauldown recovery is communicated and confirmed.
- ASAC clears the helicopter for an approach.
- The helicopter co-pilot lowers the main probe and requests that the pilot put on the landing gear brakes. The pilot puts on the landing gear brakes.
- The helicopter passes through the 2 nautical mile checkpoint.
- The helicopter is conned to the final approach fix (FAF).
- OOW responds YES to recover light.
- FLYCO sets deck status lights (DSL) amber.
- The helicopter passes through the 1 nautical mile checkpoint.
- Mutual visual contact is confirmed.

6.3.4 Procedures For Daytime Hauldown Scenario

The training procedures for the Daytime Hauldown scenario are described in Table 51.

Table 51 Procedures for Daytime Hauldown Scenario

No.	Steps	Response
1	The Instructor checks that all the simulator subsystems are working properly.	
2	The Instructor checks that the Pilot has completed the pre-test procedures, including emergency power-off procedures, and is sitting in the pilot's seat with the safety harness strapped on.	
3	At the IOS display monitor, double-click on the "HelMET" icon to display the HelMET Training Window. Select "Manual Flight Mode (Cockpit)"	
4	At the IOS display monitor, Select "Pilot and IOS"	The "HelMET IOS" and the HelMET Pilot Control" windows are displayed on the IOS display monitor. An example of the "HelMET IOS" window is shown in Figure 6. An example of the "HelMET Pilot Control" window is shown in Figure 27.
5	On the "HelMET IOS" window, click on the "Initiate Session" icon.	A "Select a Mission Plan" window is displayed on top of the "HelMET IOS" window. An example of the "Select a Mission Plan" window is shown in Figure 21.
6	On the "Select a Mission Plan" window, select the "DayHaulDownLanding.mpn" mission plan for the predefined	The mission plan filename "DayHaulDownLanding.mpn" is appended to the complete file path where the predefined Daytime Launch mission plan will be loaded.

No.	Steps	Response
	Daytime Launch scenario.	
7	On the “Select a Mission Plan” window, click on the OK button.	The “Select a Mission Plan” window is closed and a “System Busy” window is displayed. An example of the “System Busy” window is shown in Figure 23.
8		After a few seconds, the “System Busy” window is closed. .
9		At the bottom of the “HelMET IOS” window, the “Initiate Session”, “Join Session”, “Debrief Missions” and “Exit” icons are replaced by “Select Roles”, “Start Session” and “End Session” icons.
10	At the “HelMET IOS” window, verify that the information for the specified mission plan is correct: Mission Plan Name: HaulDown Type: Deck Landing Procedures Details: Local Time: 14:10 Visibility: Unlimited Helo Position: Delta Hover Deck Motion: Custom Motion Lighting: Day Altimeter (in hg): 29.00 Air Temperature (ºC): 11 Ship: Heading: 285 deg Speed: 10.0 kts	

No.	Steps	Response
	Wind: Heading: 270 deg Speed: 30 kts Primary Wave Heading: 270 deg Height: 5.0 ft Period: 5.0 s	
11.	At the IOS display monitor, double-click on the “VR_Sim_Pilot” icon to start the” HelMET Pilot Control” window.	The “HelMET Pilot Control” window is displayed on the IOS display monitor. An example of the “HelMET Pilot Control” window is shown in Figure 27.□
12	On the “HelMET Pilot Control” window, select the Video from the Settings pull-down menu.	The “Video Settings” window is displayed on the IOS display monitor. An example of the “Video Settings” window is shown in Figure 11.
13	On the “Video Settings” window, click on the “VR Goggle” button and then click on the “Close” button.	
14	At the NVisor SX60 Front Control Box, turn on the power supply to the NVisor SX60 HMD by activating the power on/off button.	
15	On the “HelMET Pilot Control” window, click on the “Join Session” icon.	Two successive “System Busy” windows are displayed for a few minutes. An example of the “System Busy” window is shown in Figure 36.

No.	Steps	Response
16	On the “HelMET IOS” window, click on the “Start Session” icon.	At the “Participants“ window, an “Initializing Mission” status message appears next to the IOS. An example of the “Init Mission” window is shown in Figure 14.
17		A “System Busy” window is displayed for a few minutes.
18	After the “System Busy” window is closed, check the device indicators for changes at the “HelMET Pilot Control” window.	
19	The Instructor requests the Pilot to put on the HMD with the headset and microphone.	
20	The Instructor puts on his headset and microphone.	
21	The Instructor verifies the operation of the headset and microphone with the Pilot.	
22	On the “HelMET Pilot Control” window, click on the “Fwd/Aft”, “Up/Down”, “Heading” and “Left/Right” buttons to adjust the Pilot eyepoint control for viewing.	The pilot’s view displayed on the repeater display monitor should have moved accordingly.
23	Release the Stop button located at the Instructor Operator Station.	The electrical power is applied to the Motion Platform Subsystem EMS motor drives.
24	On the “HelMET Pilot Control” window, click on the Platform Control “Start”, button to enable power to the Motion	The “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?”dialog window is displayed.

No.	Steps	Response
	Platform Subsystem.	
25	On the “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window, click on the “Yes” button.	After the “Warning Not following the correct procedure could cause the platform to behave violently. Is the Motion Platform power on with both an amber and red light on?” dialog window is closed, the green Platform indicator is displayed at the “HelMET Pilot Control” window.
26	On the “HelMET Pilot Control” window, click on the “Ready” button.	The “Pilot Reminder” window is displayed. An example of the “Pilot Reminder” window is shown in Figure 37.
27	On the “Pilot Reminder” window, click on the “Yes” button.	The “Pilot Reminder” window is closed.
28		At the “HelMET Pilot Control” window, the Participant status message (Pilot Control Ready for Missions) is displayed.
29		At the “HelMET IOS” window, the Participant status message (Pilot Control Ready for Mission) is displayed.
30	On the “HelMET IOS” window, click on the “Ready” button.	The green Ready button indicator is displayed. The “Start Mission” button is available.
31		At the “Ship Control” window, no lighting buttons are displayed.
32		At the “Cable Tension Control” window, the Cable Tension value of 0 lbs is displayed.
33		At the “Trafficator Lights” window, the Red, Green and Off trafficator lights are not selected.

No.	Steps	Response
34		At the “Trafficator Lights” window, the amber trafficator light is displayed.
35		At the “Hauldown Control” window, the Tail Probe Up indicator is displayed.
36		At the “Hauldown Control” window, the Main Probe Down indicator is displayed.
37		At the “Hauldown Control” window, the Messenger Separated indicator is displayed.
38		At the “Hauldown Control” window, the Landing Gear Up icon is displayed.
39		At the “Trap Control” window, the RSD trap is open.
40		At the “Trap Control” window, the Helo Trapped indicator is not displayed.
41		At the “Helo Status” window, the Winch indicator is displayed with the OFF value.
42		At the “Helo Status” window, the green Main Probe Down indicator is displayed.
43		At the “Helo Status” window, the Tail Probe Down indicator is not displayed.
44		At the “Helo Status” window, the green Trapped indicator is not displayed.
45		At the “Ship Status” window, check the ship heading and speed, true wind direction and speed, relative wind direction and speed, and altimeter for correctness.

No.	Steps	Response
46		At the “Situation Awareness” window, the RSD trap is open and the red flag is in the down position.
47		At the “Situation Awareness” window, the green YES and amber RCVR buttons are displayed.
48		At the “Situation Awareness” window, the amber trafficator light is displayed.
49		At the “Situation Awareness” window, the Cable Tension value of 0 lbs is displayed.
50	On the “HelMET IOS” window, click on the “Start Mission” button.	The green mission status indicator is displayed to indicate that the mission has started. An example of the HelMET IOS running window is shown in Figure 16.
51	The Instructor (OOW) calls: “Bird boat call paddles for control”.	
52	The Pilot calls: “Boat bird roger break break paddles bird calling for control”.	
53	The Instructor calls: “Bird paddles roger <pause> signal charlie hauldown”.	
54	On the “Trafficator Lights” window, click on the green trafficator light.	At the “Situation Awareness” window, the green trafficator light is displayed.
55	The Pilot ensures that the green trafficator light is displayed.	
56	The FLYCO monitors mission, helo status and initiates Wave_Off as required.	

No.	Steps	Response
57	The Instructor evaluates the ship deck motion, monitors the relative wind speed and direction, and monitors the helicopter position.	
58	The Instructor (NFC) maintains to monitor flight instruments for aircraft positioning.	
59	The Pilot controls the helicopter to hover port side.	
60	When the single engine speed is dropping below the safe limit, the Instructor (NFC) reports a "Safe single engine speed".	
61	The Pilot controls the helicopter to high hover over the RSD.	
62	On the "Hauldown Control" window, click the Landing Gear Down button.	At the "Hauldown Control" window, the Landing Gear Down icon is displayed.
63	The Pilot ensures that the helicopter landing gear is down.	
64	The Instructor (NFC) calls: "Two down and locked, bug light my side".	
65	The Pilot calls: "Bug light my side".	
66	The Instructor (NFC) advises on the helicopter fore/aft position by calling: "Steady", "Back one", "Ahead three", or "Good position".	

No.	Steps	Response
67	The Pilot controls the helicopter to arrive at hover over the RSD.	
68	The Pilot maintains the helicopter in a stable hover position.	
69	The Pilot calls: “Lower the messenger”.	
70	On the “Hauldown Control” window, click on the Messenger Down button.	Wait for a few minutes. At the “Hauldown Control” window, the OUT display indicator is displayed.
71	The Deck Crew moves into position and ground the messenger cable.	
72	The Instructor calls: “Stop lowering”.	
73	The Deck Crew connect the messenger cable and H/D cables.	
74	On the “Hauldown Control” window, click on the Messenger OFF button.	At the “Helo Status” window, the Winch indicator is changed from OUT to JOINED.
75	On the “Trafficator Lights” window, select the Amber trafficator light.	At the “Situation Awareness” window, the amber trafficator light is displayed.
76	The Pilot maintains the helicopter in a stable hover position.	
77	The Instructor (NFC) provides a signal to stop lowering.	

No.	Steps	Response
78	The Deck crew provide a signal to raise the cable.	
79	The Instructor monitors the Deck Crew position.	
80	The Instructor calls: “Raise the messenger”.	
81	On the “Trafficator Lights” window, select the green trafficator light.	At the “Situation Awareness” window, the green trafficator light is displayed.
82	On the “Hauldown Control” window, click the Messenger Up button.	At the “Situation Awareness” window, the Winch indicator is changed from JOINED to 3_GREEN.
83	The Instructor ensures that the Winch cable is not fouled.	
84	The Instructor ensures that the Winch cable is steady while it is being raised.	
85	The Instructor ensures that the Main Probe retracts and extends.	
86	The Deck Crew leave the flight deck.	
87	The Instructor (NFC) monitors the Haul Down Panel.	
88	The Instructor (NFC) ensures that the Winch cable is seated and separated.	At the “Hauldown Control” window, the Messenger SEPARATED and LOCKED IN indicators are displayed.
89	The next few steps must be	

No.	Steps	Response
	executed in a very fast sequence.	
90	The Instructor (NFC) calls: “Three green”.	
91	The Pilot calls: “Three green hover tension max tension is 850 pounds”.	
92	On the “Cable Tension Control” window, click on the Min button.	At the “Cable Tension Control” window, the green Min button indicator is displayed.
93	The Instructor engages the H/D mode.	
94	The Instructor (NFC) advises on the helicopter fore/aft position by calling: “Steady”, “Back”, “Ahead”, “Drifting” or “Good Position”.	
95	The Instructor checks that the amber H/D light is lit.	
96	The Instructor checks that the 2 Ft/Sec light is lit.	
97	The Instructor checks the tension meter between (200-400) pounds at the “Situation Awareness” window.	
98	The Pilot maintains the helicopter in a stable hover position.	
99	The Instructor ensures that the cable reels in at approximately	

No.	Steps	Response
	2 ft/sec.	
100	The Instructor observes the cable until it is taut.	
101	At the “Cable Tension Control” window, the cable tension is set to 850 pounds.	At the “Situation Awareness” window, the cable tension is set to 850 pounds.
102	The Instructor checks that the 2 ft/sec light goes out.	
103	On the “Cable Tension Control” window, click on the Hover button.	At the “Cable Tension Control” window, the green Hover button indicator is on.
104		At the “Situation Awareness” window, the cable tension is set to 1500 pounds.
105	On the “Trafficator Lights” window, click on the amber trafficator light.	At the “Situation Awareness” window, the amber trafficator light is displayed.
106	The Pilot maintains the helicopter in a stable hover position.	
107	The Pilot monitors the natural horizon and horizontal reference bars, and evaluates the ship deck motion for a steady period.	
108	The Pilot controls the helicopter to low hover over the RSD.	
109	The Pilot monitors the ship deck position relative to hangar line-up lines.	

No.	Steps	Response
110	The Pilot monitors the fore/aft positions with updates from the Instructor (NFC), makes aircraft position adjustments, and maintains the helicopter in a stable hover position.	
111	The Pilot calls: “Ready to land”.	
112	If the Main Probe will not enter the RSD, the Instructor transmits position corrections with calls: “Left”, “Right”, “Ahead”, “Back”, “Up”, “Down”, or “Steady”.	
113	If the ship deck motion is not steady, the Instructor awaits the next steady period.	
114	The Instructor calls: “Land now, down down down”.	
115	On the “Trafficator Lights” window, click on the green trafficator light.	At the “Situation Awareness” window, the green trafficator light is displayed.
116	The Pilot ensures that the green trafficator light is on.	
117	On the “Cable Tension Control” window, click on the Max button.	At the “Cable Tension Control” window, the green Max button indicator is displayed.
118		At the “Situation Awareness” window, the tension is set to 4000 pounds.
119	The Pilot lands the helicopter on the ship flight deck.	

No.	Steps	Response
120	The Instructor observes that the helicopter has landed on the ship flight deck.	
121	The Instructor observes that the Main Probe has entered the RSD capture area.	
122	On the “Trap Control” window, click on the RSD trap.	At the “Trap Control” window, the RSD trap is closed.
123		At the “Situation Awareness” window, the RSD red flag is up.
124	If the green Helo in trap indicator is not on, perform the next four steps.	
125	On the “Trap Control” window, select the Max button.	At the “Situation Awareness” window, the tension is set to 4000 pounds.
126	On the “Trap Control” window, click on the RSD trap.	At the “Trap Control” window, the RSD trap is closed.
127		At the “Situation Awareness” window, the RSD red flag is up.
128	If the helicopter trapped indicator is not on, initiate lashing routine.	
129	The Instructor calls: “In the trap, trapped, down tail probe”	
130	On the “Trafficator Lights” window, select the amber trafficator light.	At the “Situation Awareness” window, the amber trafficator light is displayed.
131	On the “Hauldown Control”	At the “Helo Status” window, the Tail Probe Down

No.	Steps	Response
	window, click on the Tail Probe Down button.	indicator is displayed.
132	The Instructor calls: “In the rails”.	
133	On the “HelMET IOS” window, click on the “Pause” button.	The yellow HelMET IOS Status and Pause button indicators are displayed. An example of the HelMET IOS Pause window is shown in Figure 16.
134	On the “HelMET IOS” window, click on the “Stop” button.	A “HelMET IOS” window with the Close button is displayed.
135	On the “HelMET Pilot Control” window, click on the Platform Control “Stop” button to remove power to the Motion Platform Subsystem EMS motors.	The “System Busy” window is displayed for a few minutes.
136	Press the Stop button located at the Instructor Operator Station.	
137	At the NVisor SX60 Front Control Box, turn off the power supply by depressing the power on/off button.	
138	On the “HelMET Pilot Control” window, select the Video Settings from the Settings pull-down menu.	The “Video Settings” window is displayed on the IOS display monitor.
139	On the “Video Settings” window, click on the “Monitor” button.	The “If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been turned off?” dialog window is displayed on the IOS display monitor.
140	On the “If the video output is changed while the goggles are still on, severe damage to the	The “If the video output is changed while the goggles are still on, severe damage to the goggles will occur. Has the VR goggle control box been

No.	Steps	Response
	goggles will occur. Has the VR goggle control box been turned off?" dialog window and click the "Yes" button.	turned off?" dialog window is closed.
141	On the "Video Settings" window, click on the "Close" button.	The "Video Settings" window is closed.
142	On the "HelMET IOS" window, click on the "Close" button.	The "Save missions for later review?" dialog window is displayed. An example of the "Save missions for later review?" dialog window is shown in Figure 25.
143	On the "Save missions for later review?" dialog window, click on the "Yes" button.	The "Save missions for later review?" dialog window is closed.
144		The "Enter the name of the file to save the mission" window is displayed. An example of the "Enter the name of the file to save the mission" window is shown in Figure 26.
145	On the "Enter the name of the file to save the mission" window, enter a filename with extension (e.g. hauldown_1.log) and click on the "OK" button.	The "Enter the name of the file to save the mission" window is closed and the "HelMET IOS" window with an "End Session" icon is displayed. An example of the HelMET IOS window is shown in Figure 13.
146	On the "HelMET IOS" window, click on the "End Session" icon.	The "The master has closed the session" window is displayed. An example of the "The master has closed the session" window is shown in Figure 24.
147	On the "The master has closed the session" window, click on the "OK" button.	The "The master has closed the session" window is closed.
148	On the "HelMET IOS" window, click on the "Review Missions" icon.	The "HelMET IOS" window with a list of filenames is displayed.
149	On the "HelMET IOS" window, select the previously	

No.	Steps	Response
	entered filename (e.g. hauldown_1.log) and click on the “OK” button.	
150	On the “HelMET IOS” window, select the LSO Model: EyePoint from the Available Viewpoints.	The LSO Model viewpoint is displayed on the “HelMET IOS” window. An example of the LSO Model viewpoint on the “HelMET IOS” window is shown in Figure 20.
151	On the “HelMET IOS” window, select the double right arrow button to replay at a fast forward speed.	The LSO Model viewpoint is redisplayed at a fast forward speed.
152	On the “HelMET IOS” window, click on the “Close” button.	
153	On the “HelMET IOS” window, click on the “Exit” icon.	The “HelMET IOS” window is closed.
154	On the “HelMET Pilot Control” window, click on the “Exit” icon.	The “HelMET Pilot Control” window is closed.
155	The Instructor removes the headset and microphone.	
156	The Instructor requests the Pilot to close his eyes for a few seconds.	
157	After a few seconds, the Instructor requests the Pilot to remove the HMD.	
158	The Instructor places the HMD in a holder at the back of the pilot’s seat.	
159	The Instructor helps the Pilot to	

No.	Steps	Response
	remove the safety harness.	
160	The Instructor helps the Pilot step down from the Motion Platform.	

7 Notes

7.1 Abbreviations and Acronyms

Item	Descriptions
AC	Alternating Current
ADA	Analogue Distribution Amplifier
AGL	Above Ground Level
AGP	Advanced Graphics Port
AMLCD	Active Matrix Liquid Crystal Display
API	Application Programming Interface
APP	Aft Perpendicular Position
ASAC	Anti-Submarine Air Controller
ASCII	American Standard Commission Information Interchange
ASE	Automatic Stabilization Equipment
ASL	Above Sea Level
ASW	Anti-Submarine Warfare
C	Centigrade (or Celsius)
CD-ROM	Compact Disc Read Only Memory

Item	Descriptions
CF	Canadian Forces
CFB	Canadian Forces Base
CFTO	Canadian Forces Technical Order
CL	Centre Lighting
cm	Centimetre
COG	Centre of Gravity
COTS	Commercial Off-The-Shelf
CPF	Canadian Patrol Frigate
CPU	Central Processing Unit
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
DAC	Digital to Analogue Converter
dB	Decibel
IOS	The operator or person controlling the HelMET or HelMET.
DLP	Deck Landing Procedure
DMSO	Defence Modelling and Simulation Organization
DoD	Department of Defense

Item	Descriptions
DOF	Degrees of Freedom
DOS	Disk Operating System
DRAM	Dynamic Random Access Memory
DRDC	Defence R&D Canada
DSL	Deck Status Light
FAF	Final Approach Fix
FDFL	Flight Deck Flood Lights
FLTK	Fast Light Tool Kit
FLUID	Fast Light User Interface Designer
FLYCO	Flying Co-ordinator
FOM	Federate Object Model
FOV	Field of View
FP	Flying Pilot
FTP	File Transfer Protocol
GB	Gigabytes
GUI	Graphical User Interface

Item	Descriptions
HAM	Helicopter Air Maneuvers
HDL	Helicopter Deck Landing
HDLS	Helicopter Deck Landing Simulator
HelMET	Helicopter Maritime Environment Trainer
HFL	Hangar Face Lighting
HLA	High Level Architecture
HMD	Head Mounted Display
Hz	Hertz
HRS	Horizontal Reference System
HTL	Hangar Top Lighting
HUD	Head Up Display
HWCI	Hardware Configuration Item
ICS	Internal Communication System
ID	Identification
I/O	Input/Output
IOS	Instructor Operator Station

Item	Descriptions
IP	Internet Protocol
IPD	Inter-Pupilary-Distance
ISA	Industry Standard Architecture
kts	Knots
kPa	Kilo Pascal
LAN	Local Area Network
LCG	Longitudinal Centre of Gravity
LED	Light Emitting Diode
LNCH	Launch
LSO	Landing Signals Officer
LOD	Level of Detail
m	Metre
MARIN	Maritime Research Institute Netherland
MB	Megabytes
MS/DOS	MicroSoft Disk Operating System

Item	Descriptions
MSL	Mean Sea Level
N/A	Not Applicable
NIM	Network Interface Module
nmi	Nautical Miles
NFC	Non-Flying Crew
NFP	Non-Flying Pilot
OEM	Original Equipment Manufacturer
OM	Operator Manual
OOW	Officer of The Watch
OSD	Operational Sequence Diagram
PC	Personal Computer
PCI	Peripheral Component Interconnect
PROM	Programmable Read Only Memory
RAM	Random Access Memory

Item	Descriptions
RAST	Recovery Assist Secure Traverse
RAT	Robust Audio Tool
RCVR	Recovery
RGB	
RHS	Reconfigurable Helicopter Simulator
RMS	Root Mean Square
RSD	Recovery Securing Device
RTI	Run Time Infrastructure
SAC	Shipborne Air Controller
SBC	Single Board Computer
SCSI	Small Computer Standard Interface
SEU	System Electronics Unit
SGI	Silicon Graphics Inc.
SHINCOM	Ship Integrated Communication System
SHOP	Shipborne Helicopter Operating Procedures
SMART	Simulation Modeling Acquisition Rehearsal Training
SPS	Software Product Specification

Item	Descriptions
STD	Software Test Description
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
UPS	Uninterruptible Power Source
UTIAS	University of Toronto Institute For Aerospace Studies
VAC	Voltage Alternating Current
VCG	Vertical Centre of Gravity
VDC	Voltage Direct Current
VDD	Version Description Document
VFR	Visual Flying Rule
VGA	Video Graphics Adapter
VR	Virtual Reality
VR-Sim	Virtual Reconfigurable Simulator

7.2 Glossary

Term	Definition
Briefing	The period in which an instructor provides a pilot with information regarding the current mission plan prior to a training exercise.
Debriefing	The period in which an instructor provides feedback to the pilot on his/her performance during the training exercise.
Exercise	The period between briefing and debriefing when a pilot execute missions while an instructor monitors progress.
Delta Hover	The helicopter is holding a pattern of 2-180 degree turns in large oval about 1 nautical mile back of the ship at an approximate altitude of 200 feet at a speed of 70-90 knots. Where fuel efficiency is required, 70 knots is chosen.
Delta Hover Astern	The helicopter is flying in a pattern of approximately 45 degrees off the ship stern quarter at a distance of 2,5 – 3 rotor arcs at an altitude of 40 – 60 feet.
Federate	A High Level Architecture term describing a single executable in a federation.
Federation	A High Level Architecture term describing a collection of federates all working together during a simulation exercise.
High Hover	The helicopter is flying in a pattern of 20 – 25 feet above the deck as if one were sitting on the top edge of the hangar face with feet dangling down.
High Hover Starboard of The RSD	The helicopter is flying at a pattern of high hover altitude but aligned with the starboard traffic indicator, nets directly below the starboard side of the helicopter.
Individual/Participant	A single person involved in the training session. An individual can act as either a pilot or an instructor.
Instructor	A teaching role in a training exercise. An acting instructor will brief a pilot on a given mission plan, monitor progress, then provide performance feedback during a debriefing.

Term	Definition
Inter-Pupilary-Distance (IPD)	The Inter-Pupilary-Distance (IPD) is the distance between the right and left pupils. This parameter is adjustable and will vary from use to user.
Lashing	Lashings consist of a minimum of four chains (attached to separate tie-down rings) to prevent movement or rotation of the rotation. When it is intended to shut down the helicopter, or if the ship motion exceeds 1 degree pitch and 3 degree roll, aircraft-to-deck chain lashings are to be installed immediately after landing and removed just prior to take-off.
Lower Hover	The helicopter is flying in a pattern of centred over the RSD at an altitude high enough such that the tail wheel is maintained safely above the moving deck.
Master	A role in which the mission plan is selected, configured, started, stopped, and paused for all other roles. An individual assuming the master role can also provide global debriefing during a team training exercise.
Mission	An attempt by the players to achieve the objectives outlined in the mission plan. There can be multiple missions within a training exercise.
Mission Plan	A scenario is often defined as a set of important parameters. A mission plan is an instance of the scenario with assigned parameter values.
Non-Flying Crew (NFC)	The Non-Flying Crew (NFC) includes all those in the helicopter that are not actively flying the aircraft, including the non-flying pilot (co-pilot) and persons in the cabin.
Operator	An individual assisting in the training of a pilot. An operator (e.g. instructor) can perform a number of different roles concurrently. There can be multiple operators in a training session, all with different roles and responsibilities. An operator can assume the role of a team player.
Player	A special interactive role involved directly in the execution of a training exercise. Such a role can be adopted by an operator through the use of a simple graphical user interface terminal, or by a student

Term	Definition
	through either a terminal or a virtual environment.
Logging	The storing of federate data required for playing back in a training exercise.
Role	A function or responsibility assumed by an individual during the training simulation. A single individual can have many concurrent roles. Roles include that of the instructor, master, and the various players involved in a training exercise.
Scenario	A specific configuration of players acting together to perform a series of objectives under conditions described by mission parameters.
Session	The progression from briefing, to exercise, to debriefing when running a mission plan. A session is active once a mission plan has been selected, all participants have connected together, and all roles have been assigned.
Signal Charlie	It means cleared to make an approach to hover over the deck and lower the messenger; it is not clear to land.
Slave	A role which the player may execute in a training exercise. A slave is normally controlled by the master.
Student	An individual to be trained using the Helicopter Deck Landing Simulator. A student can only assume a single player role (e.g. pilot).
Terminal	A Graphical User Interface (GUI) display monitor with keyboard and mouse used by an individual for assuming a given player role in a training exercise.
Training Playback	The replaying of a previously recorded exercise from a player perspective. Training playback is a tool used by an instructor during debriefing.

UNCLASSIFIED

DOCUMENT CONTROL DATA
(Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)

1. ORIGINATOR (The name and address of the organization preparing the document, Organizations for whom the document was prepared, e.g. Centre sponsoring a contractor's document, or tasking agency, are entered in section 8.) Publishing: DRDC Toronto Performing: DRDC Toronto Monitoring: Contracting:	2. SECURITY CLASSIFICATION (Overall security classification of the document including special warning terms if applicable.) UNCLASSIFIED

3. TITLE (The complete document title as indicated on the title page. Its classification is indicated by the appropriate abbreviation (S, C, R, or U) in parenthesis at the end of the title)

Helicopter Maritime Environment Trainer: Operator Manual (U)
Simulateur d’entraînement virtuel maritime : Manuel de l'opérateur (U)

4. AUTHORS (First name, middle initial and last name. If military, show rank, e.g. Maj. John E. Doe.)

See Original Document. Edited by: Leo Boutette , Ken Ueno, Jason Dielschneider

5. DATE OF PUBLICATION (Month and year of publication of document.) June 2011	6a NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.) 252	6b. NO. OF REFS (Total cited in document.)

7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of document, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)

Technical Memorandum

8. SPONSORING ACTIVITY (The names of the department project office or laboratory sponsoring the research and development − include address.)

Sponsoring:
Tasking:

9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant under which the document was written. Please specify whether project or grant.)	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)
10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document) DRDC Toronto 2011−047	10b. OTHER DOCUMENT NO(s). (Any other numbers under which may be assigned this document either by the originator or by the sponsor.)

11. DOCUMENT AVAILABILITY (Any limitations on the dissemination of the document, other than those imposed by security classification.)

Unlimited distribution

12. DOCUMENT ANNOUNCEMENT (Any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availability (11), However, when further distribution (beyond the audience specified in (11) is possible, a wider announcement audience may be selected.))

Unlimited announcement

UNCLASSIFIED

DOCUMENT CONTROL DATA

(Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)

13. ABSTRACT (A brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), (R), or (U). It is not necessary to include here abstracts in both official languages unless the text is bilingual.)

(U) The Helicopter Maritime Environment Trainer (HelMET) was developed by Defence R&D Canada – Toronto (DRDC Toronto) for training helicopter pilots to land on the flight deck of a Canadian Patrol Frigate (CPF) in a virtual environment. The HelMET was installed at 12 Wing, Canadian Forces Base (CFB) Shearwater, Nova Scotia, Canada. [reference: Summary per document cited in next paragraph].

DRDC Toronto Document: CR2002−022 Atlantis Document: ED997−00368 titled Helicopter Maritime Environment Trainer: Operator Manual documented Version 1.1 of the HelMET Software.

As third party support for the HelMET system did not come to fruition, DRDC Toronto has been supporting the HelMET system at 12th Wing Shearwater with hardware and software updates. The current version of HelMET is Version 4.4. Many of the updates implemented were made to allow the simulator to be used as a procedures trainer.

This document is a revision of CR2002−022 updated to reflect the large number of changes that have been implemented by DRDC Toronto since version 1.1. The purpose of this document is to update the description so that the system can be maintained and operated by Director Aerospace Development Program Management, Radar and Communications Systems or its representatives.

(U) Le Simulateur d’entraînement virtuel pour hélicoptère maritime (HelMET) a été développé par Recherche et développement pour la défense Canada – Toronto (RDDC Toronto) afin d’entraîner les pilotes d’hélicoptère à l’atterrissage sur le pont d’envol d’une frégate canadienne de patrouille dans un environnement virtuel. Le système HelMET a été installé à la 12e Escadre, Base des Forces canadiennes Shearwater, Nouvelle Écosse, Canada [référence : sommaire par document cité dans le paragraphe suivant].

Document RDDC Toronto : CR2002 022, document Atlantis : ED997 00368 intitulé Simulateur d’entraînement virtuel pour hélicoptère maritime : Manuel de l’opérateur, documentation de la version 1.1 du logiciel HelMET.

Étant donné que la prise en charge du système HelMET par un tiers ne s’est pas réalisée, c’est RDDC Toronto qui en assure, par conséquent, le soutien à la 12e Escadre Shearwater au moyen de mises à niveau de matériel et de mises à jour de logiciel. La dernière version du logiciel HelMET est la version 4.4. De nombreuses fonctionnalités qui ont été implémentées visaient à permettre au simulateur d’être utilisé comme système d’entraînement aux procédures

14. KEYWORDS, DESCRIPTORS or IDENTIFIERS (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

(U) Virtual reality ; Team Trainer; Helicopter Deck Landing; Sea King; Canadian Patrol Frigate; simulator; part−task trainer

Defence R&D Canada

Canada's Leader in Defence
and National Security
Science and Technology

R & D pour la défense Canada

Chef de file au Canada en matière
de science et de technologie pour
la défense et la sécurité nationale

DEFENCE DÉFENSE

www.drdc-rddc.gc.ca